

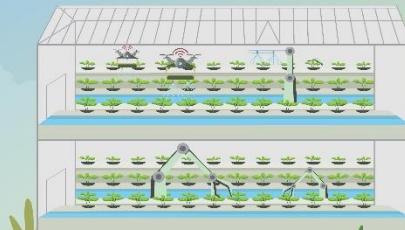
# Building a Food Resilient Future



## Programme details:

<b>3.00pm</b>	Welcome Remarks (by Mr Melvin Chow, Senior Director, Food Supply Resilience Division, SFA )
<b>3.05pm</b>	Growing the Agri-food Sector and Achieving “30 by 30” Goal (by Ms Sim Wi Min, Deputy Director, Food Supply Resilience Division, SFA )
<b>3.20pm</b>	Submission Requirements under the Building Control Act (by Mr Wong Sze Yin, Senior Architect, Building Plan and Management Group, BCA) ➤ Submissions required for plans approval, commencement of work and TOP/CSC
<b>3.40pm</b>	Fire Safety Requirements (by Ms Koh Swee Lian, Fire Safety Department, SCDF, seconded to SFA) ➤ Fire safety requirements for farms
<b>4.00pm</b>	Drainage and Catchment Requirements (by Ms Cheryl Koh and Ms Tan Sok Hian, Engineer, PUB) ➤ Managing peak runoff at source ➤ Best management practices for water pollution control
<b>4.20pm</b>	Discussion and Q&A Segment (Agencies represented: BCA, LTA, NEA, NParks, PUB, SCDF, SFA, URA)
<b>5.00pm</b>	End of Session

An Industry Guide has been launched on 9 October 2020 to provide companies in the farming industry with one consolidated knowledge resource.



Download a copy  
of [Starting A Farm:  
An Industry Guide](#)  
here!



SCAN ME

# WELCOME!



Singapore  
Food  
Agency



## Growing the Agri-food Sector and Achieving “30 by 30”

Presenter: Singapore Food Agency

QP Clinic Webinar, 13 Oct 2020

# Singapore Food Agency (SFA)

**Vision**

Safe Food for All

**Mission**

To ensure and secure a supply of safe food

- Formed on 1<sup>st</sup> April 2019
- Brings together all food-related resources and capabilities for holistic management of the food industry “from farm to fork”



New agency launched to strengthen food security and safety, from farm to fork

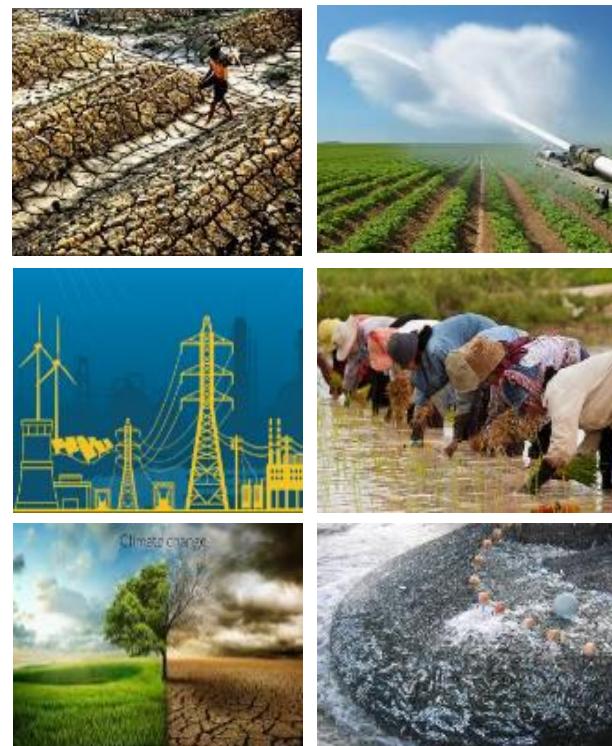
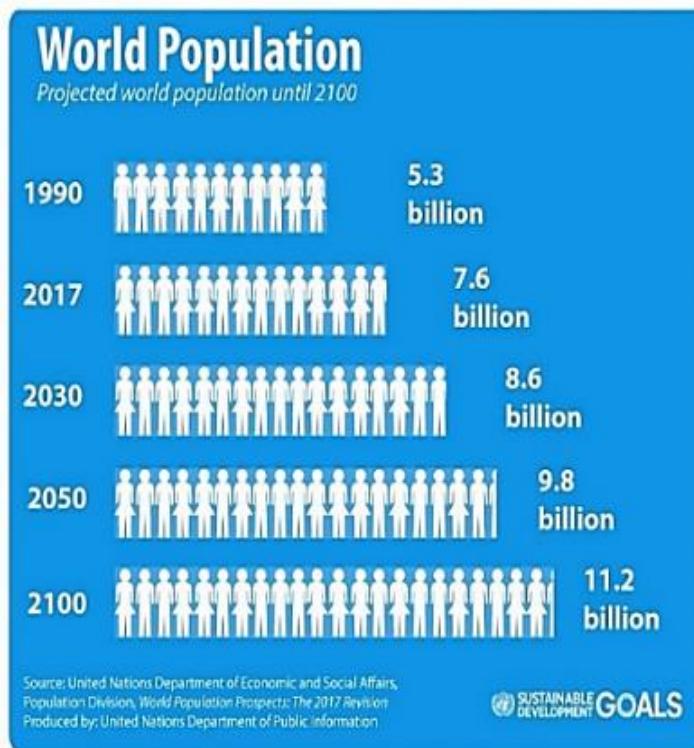


The new Singapore Food Agency will address all food-related issues, from food production to food hygiene. PHOTO: ST FILE

# The threat of a food supply disruption is real

## Global food production may not keep up with global food demand

- Global population growth, rising affluence, climate change, environmental degradation



**Singapore**

**Malaysia may stop eggs export to keep prices down**

TUESDAY, 11 DEC 2018

PUTRAJAYA: Malaysia is looking into reducing or even halting the export of eggs to ensure supply at home as well as to keep prices down.

Domestic Trade and Consumer Affairs Minister Datuk Seri Saifuddin Nasution Ismail said he would discuss the possibility with his counterpart from the Agriculture and Agro-based Industry Ministry.

**The Big Read: Global supply chain shock has farmers dumping food as consumers fret over shortages, price hikes**

With farmers and workers staying home either due to movement curbs or fears of being infected with COVID-19, the normal production capacities of farms and food processing factories have been reduced.

**Geopolitics, transport chokepoints and disease outbreaks add to the risk of potential supply disruption**

# The Singapore Food Story comprises 3 food baskets to ensure Singapore has a supply of safe food (i.e. food is available, accessible and safe)



## Grow Local

- Helps mitigate our reliance on imports and serve as a buffer during supply disruptions to import sources
- Transform agri-food industry into high-tech, high productivity sector



## Diversify Import Sources

- Reduces risk of reliance on any one supply source



## Grow Overseas

- Support our companies to expand and grow overseas so that their produce can be exported back home.

**Food must also be safe**

# '30 by 30' Goal: We aim to raise local production of nutritional needs to 30% by 2030



- Local production **buffers impact** of major overseas food supply disruption, **buys us time** to react
- **Mitigates impact of climate change and resource constraints** with environment-controlled highly productive technologies
- **Close the production loop in the long run.** R&D into innovations to allow us to produce indefinitely and not rely on external agri-input sources



Local production

This requires us to **transform the local agri-food sector** into one that is:

- Highly productive, employs climate-resilient and sustainable technologies,
- That will enable us to overcome our land, water, energy and manpower constraints.

# Transforming the agri-food sector towards the ‘30 by 30’ goal requires WOG approach through 5 strategies



# Ramping up local production through ‘30 by 30’



## SFA Initiatives

Developing farming spaces	<ul style="list-style-type: none"><li>Agricultural land plots for food farming tendered out in Lim Chu Kang and Sungei Tengah areas since 2017; productivity and track record are key criteria</li><li>Studying the expansion of sustainable fish farming in the deeper Southern Waters of Singapore</li><li>Unlocking more alternative spaces such as vacant interim state properties and rooftops. Tender for 9 HDB MSCP rooftop sites has been awarded, and more MSCP rooftop sites will be put up for tender in future</li></ul>
Co-funding support	<ul style="list-style-type: none"><li>Agriculture Productivity Fund (APF) co-funds farming systems to better control environmental variables and boost production capabilities</li><li>30x30 Express grant to support farms to ramp up local food production – 9 farms have been awarded \$39.4m of funding</li></ul>
R&D	<ul style="list-style-type: none"><li>\$144m has been made available under the Singapore Food Story R&amp;D programme</li><li>Grant calls for R&amp;D in sustainable urban food production and future foods were launched in Dec 2019</li></ul>
Manpower development	<ul style="list-style-type: none"><li>Working with other govt agencies, IHLs and industry stakeholders on manpower development to equip the workforce with the relevant skills</li><li>E.g. Work-Study Programmes with polys, Graduate Certificate programme in Food Science &amp; Technology with NTU and Wageningen University</li></ul>
Promoting local produce	<ul style="list-style-type: none"><li>2020 designated as the year to focus on the Singapore Food Story and rally support for local produce</li><li>Citizens' Workgroup to co-create ideas to increase demand for local produce</li><li>New “SG Fresh Produce” logo launched in tandem with ongoing collaborations with retailers to promote local produce</li></ul>

# As we transform and grow the sector, we will see more intensive and high-tech farm developments varying in produce type, farming systems/technology

Vertical veg farm



Vertical food fish farm, with Recirculating Aquaculture System (RAS)



Indoor, controlled environment agriculture



Greenhouse veg farm, with use of automation and IoT



# QPs have an important role in helping and guiding farms to meet agencies' regulatory safeguards



- Many of these farming systems will be **first of its kind, or unique to the farm** (type of produce, technology adopted).



- As QPs, you play a **critical role** in translating your clients' concepts and design vision into implementable plans that bridge clients' needs whilst meeting regulatory requirements.



- We encourage you to:
  - Deep dive into **understanding your clients' operating context and needs**;
  - Adopt a flexible mindset to help your clients devise **outcome-based, innovative and commercially viable solutions** that can **meet your clients' needs and also address agencies' regulatory requirements**.

# Building regulatory agility is a key ingredient in supporting the agri-food sector, a new growth area that can both boost food security and deliver economic outcomes.



- The government is constantly reviewing its processes to **build regulatory agility and a pro-enterprise environment**, to help the new generation of farm to set up quickly, and establish their businesses to contribute to food security and economic growth.
- At the same time, we roll out efforts to build up the capability and understanding of other actors in the ecosystem – farms, QPs and relevant professionals etc.
  - **Industry guide** launched on 9 Oct: to provide companies in the farming industry with one consolidated knowledge resource
  - **Webinar for QPs (today)**: agencies will share on key regulatory requirements, plan submission guidelines, and lessons gleaned from farm development cases



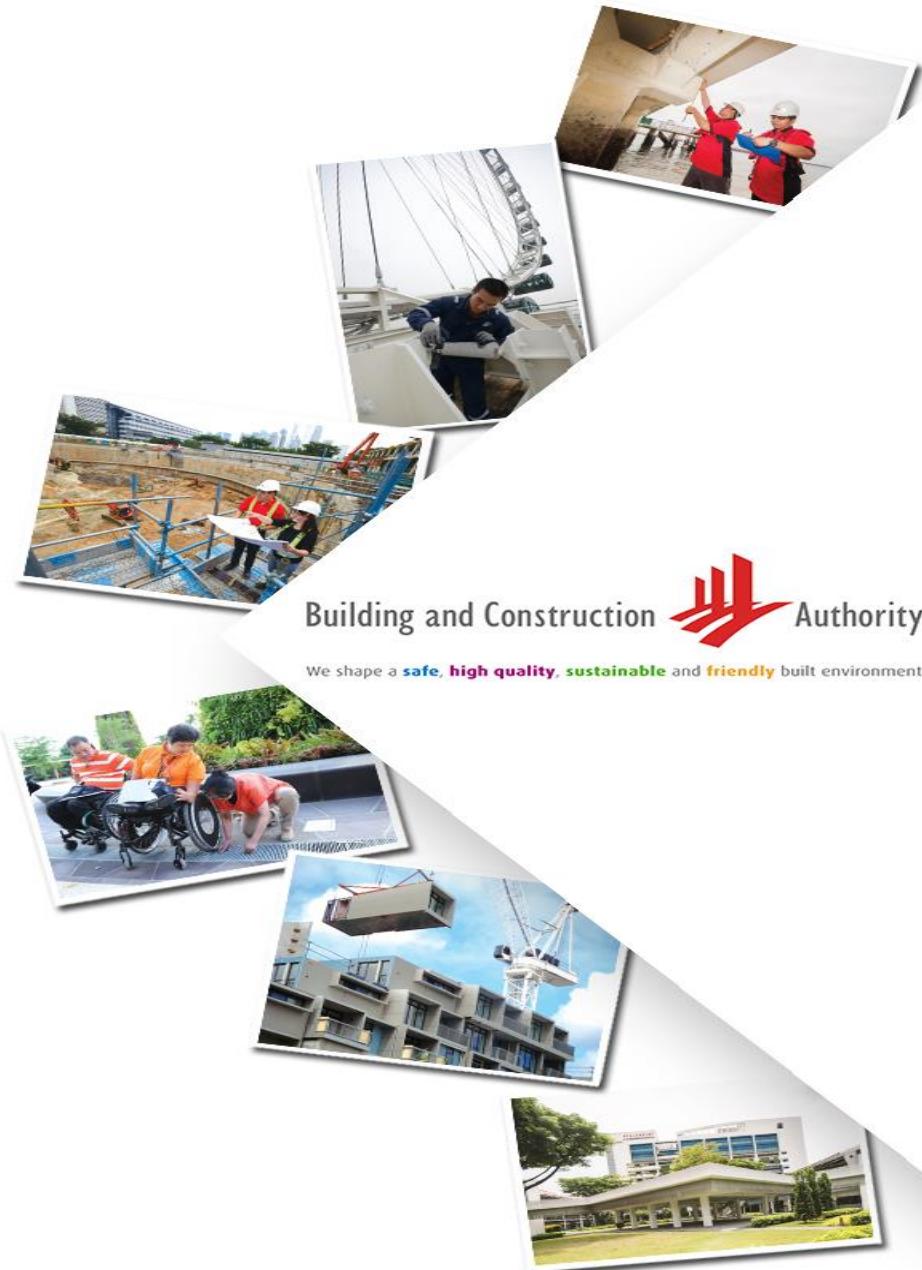
Download a copy of [Starting A Farm: An Industry Guide](#) here!



# Thank you

# Submission Requirements under the Building Control Act

Submissions for Plans Approval, Commencement  
of Works and TOP/CSC



Principal Engineer Woo Kwan Wye  
Senior Architect Wong Sze Yin

# DEVELOPMENT & BUILDING CONTROL SYSTEMS

## Development Control System (URA)

Apply for Planning Permission

Obtain Provisional Permission (PP)

Obtain Planning Permission (WP)

Commencement of Structural Works

## Building Control System (BCA)

Apply for Structural Plan approval

Apply for Building Plan Approval

- Buildability Score
- Environmental Sustainability
- BIM

Temporary Occupation Permit & Certificate of Statutory Completion

Periodic maintenance and inspection

## Technical Department Clearances

SCDF • Fire Safety

PUB • Drainage  
• Sewerage

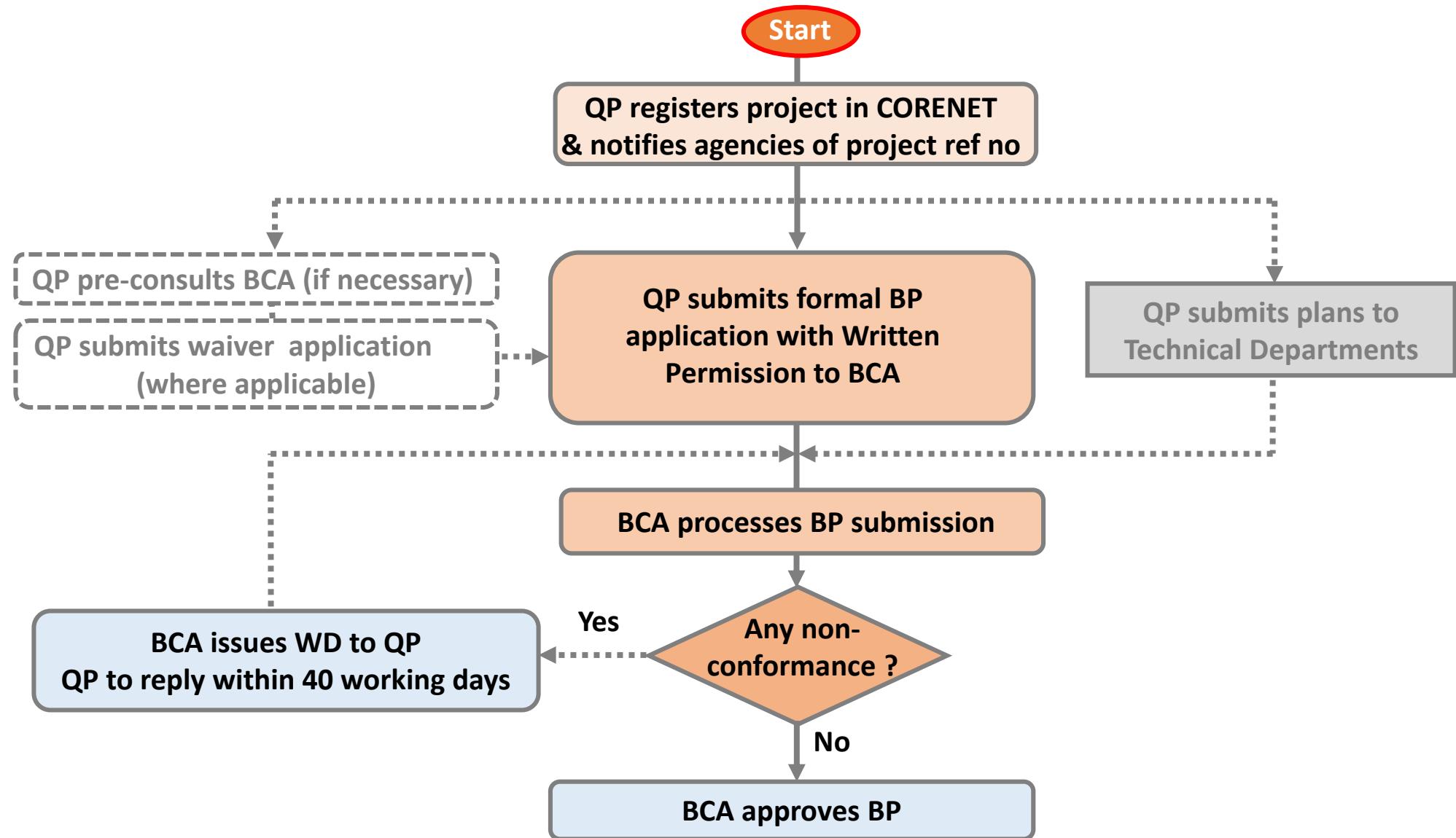
NEA • Environmental Health  
• Pollution Control

LTA • Roads & Transport  
• Vehicle Parking  
• Rails

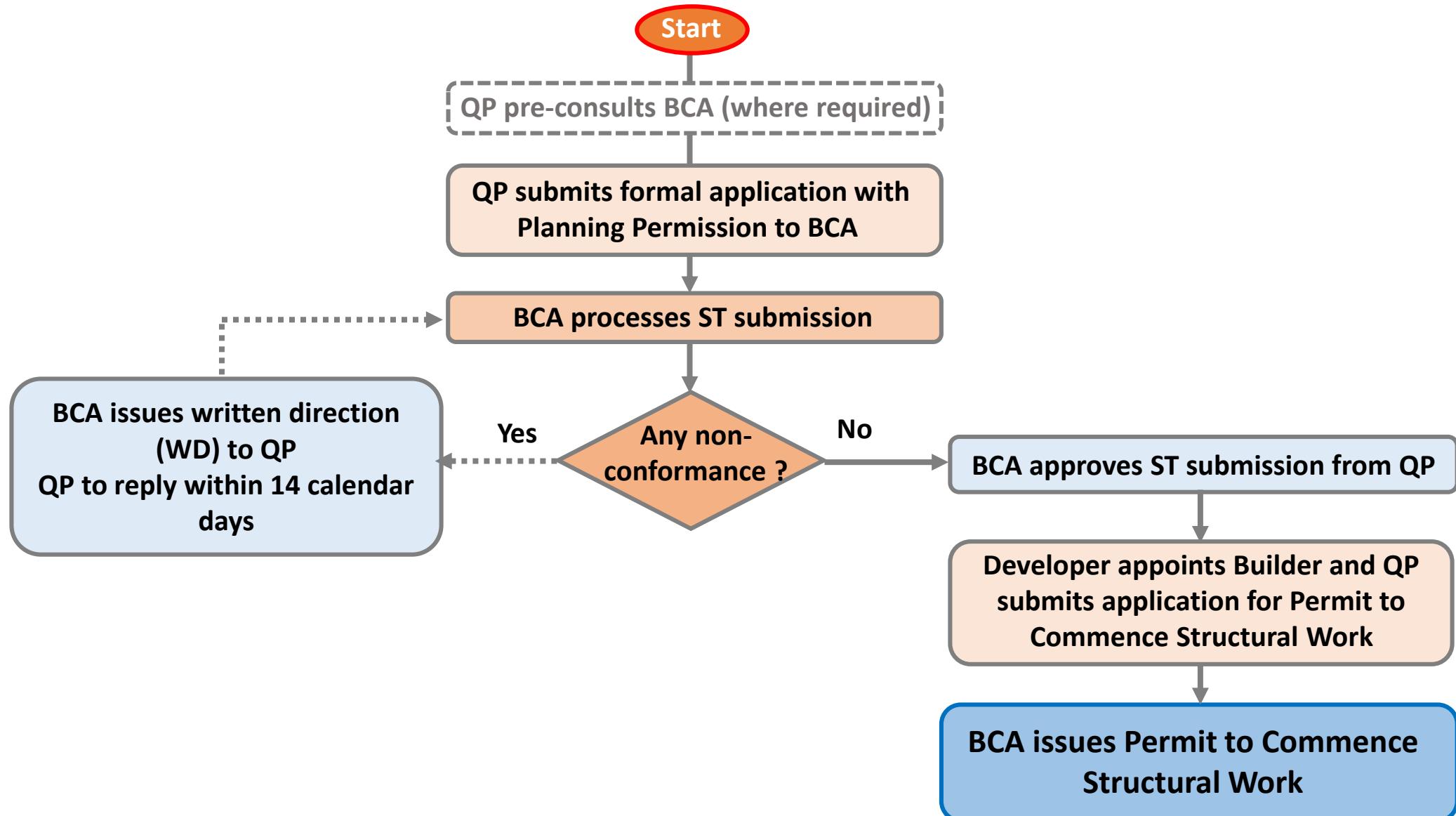
NParks • Internal  
• External

Others Eg. Aviation Control

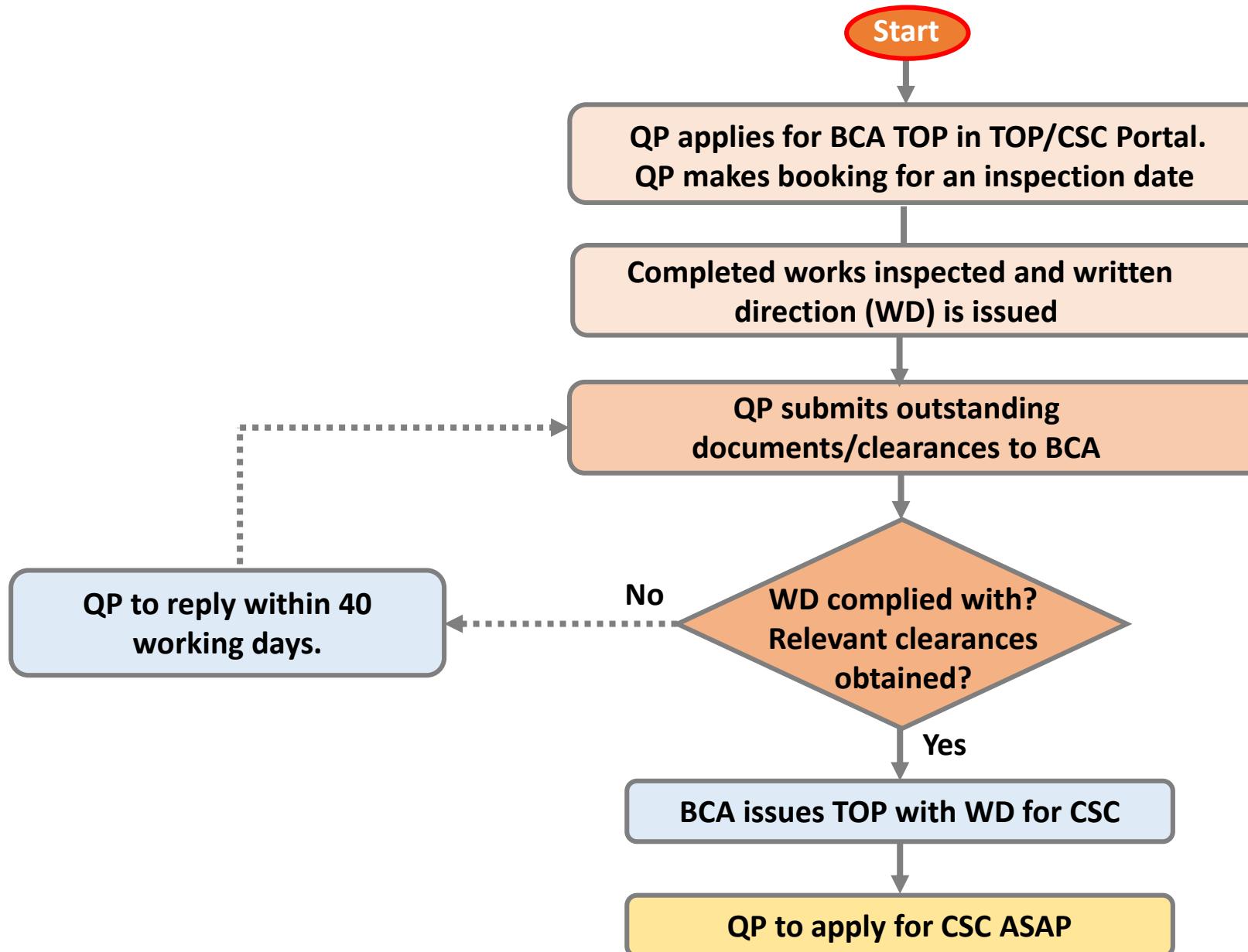
# PROCESS OF APPLYING FOR BCA BP APPROVAL



# PROCESS OF APPLYING FOR BCA ST APPROVAL



# PROCESS OF APPLYING FOR BCA TOP APPROVAL



# FREQUENTLY ASKED QUESTIONS

- First Schedule (Insignificant Building Works)

1(t) any **single storey** building used for **agriculture or to house livestock**, including a **greenhouse or a building used to house fixed plant or machinery** for the farm, provided that —

- (i) no part of the building is used as a dwelling or for the purposes of packing, exhibiting, or retailing; and
- (ii) each point of the building is situated not less than **1.5 times** its height away from any adjacent building or any route of public access;

- Plan Fees

Revised plan fee for **Type 1 General Building** (i.e. agricultural or industrial building) whose first submission to BCA (BP or ST) is on and after 31 Aug 2020.

- Accessibility Requirements

Open to exempt production areas that are not suitable for elderly and/or Person with Disabilities to work in.

# FREQUENTLY ASKED QUESTIONS

- **BIM**

Developments with GFA >5000 m<sup>2</sup> are required to submit in BIM.

- **Environmental Sustainability**

Developments with GFA  $\geq$  2000 sqm are required to meet the minimum environmental sustainability standard. This requirement will cover efficient use of resources (e.g. energy efficiency, water efficiency, waste management etc.).

- **Buildability Score**

With effect from 15 Dec 2019, projects with GFA less than 5,000 sqm are exempted from buildability legislation. Developments with GFA  $\geq$  5000 sqm are required to submit for B-score.

# Site conditions for TOP/CSC Inspection

Examples from past cases



Building and Construction Authority

We shape a **safe**, **high quality**, **sustainable** and **friendly** built environment.

# SITE CONDITIONS FOR READY TOP/CSC INSPECTION

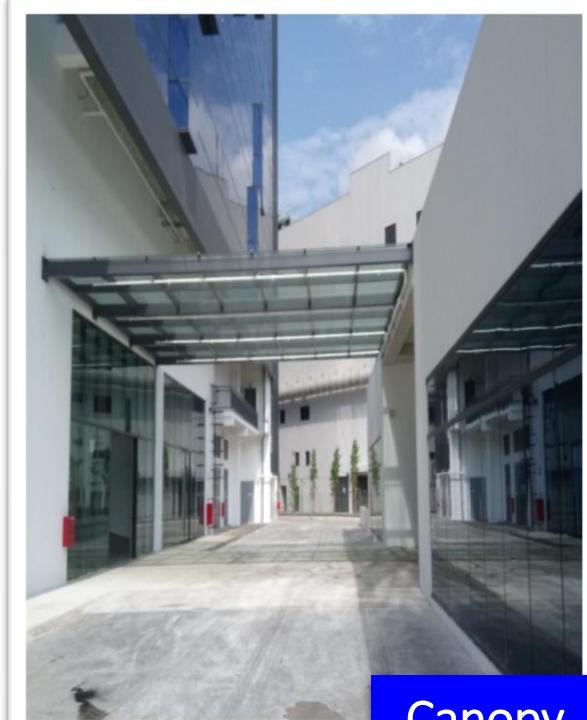
## Exteriors



Entrance



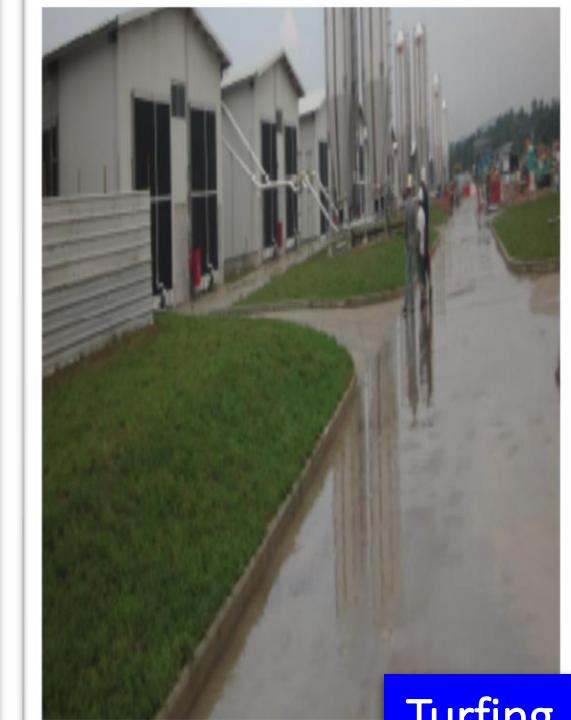
Facade



Canopy

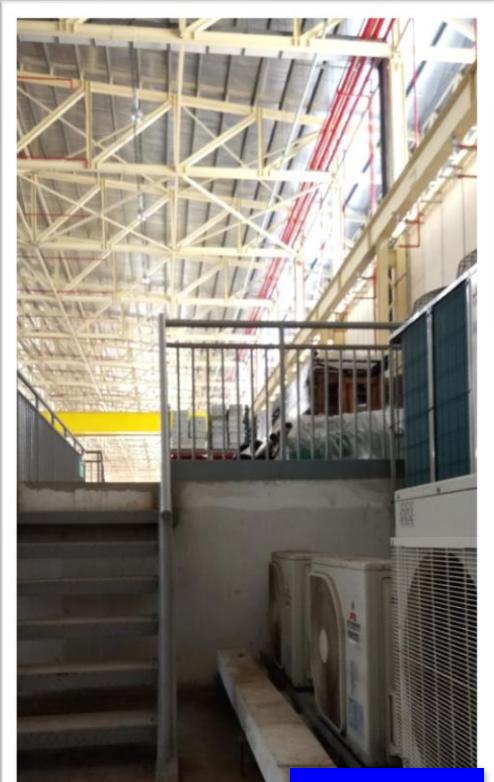


Lightning

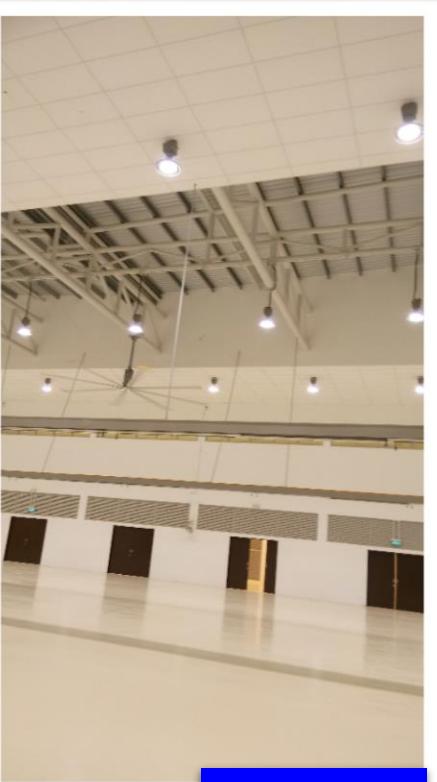


Turfing

## Interiors



M&E



Finishes



Stairs



Sign



Accessible Toilet



# SITE CONDITIONS NOT READY FOR TOP/CSC INSPECTION



Blocked access



Incomplete Walkway



Incomplete Ramp

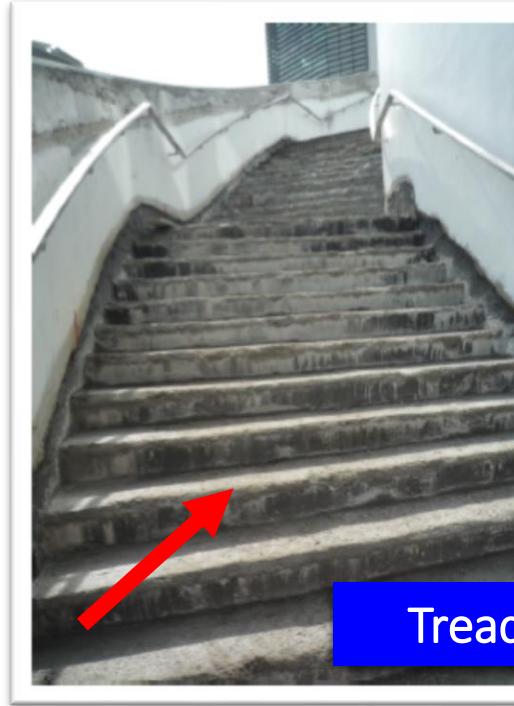


Incomplete Driveway

- Incomplete building works / immature site
- No safe and proper access to and within the development



# SITE CONDITIONS NOT READY FOR TOP/CSC INSPECTION



- Incomplete basic finishing works which affects measurements and critical safety



# SITE CONDITIONS NOT READY FOR TOP/CSC INSPECTION



Safety from falling from height



Treads, risers and safety barrier of staircases



10/2/2015



# SITE CONDITIONS NOT READY FOR TOP/CSC INSPECTION



Incomplete toilet works



Incomplete lightning conductor



Incomplete terrace



# EXPECTED SITE CONDITIONS

Site should be in **move-in** condition:

- Completed
- Clean
- Site office removed
- All equipment and materials removed
- Not occupied

For **Phased TOP**, the additional points are applicable:

- Separate public access and construction access (including vehicular access)
- Robust hoardings
- All cranes removed from site

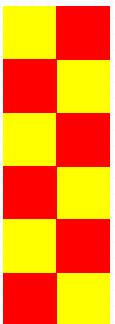
*Thank you*





**SCDF**  
The Life Saving Force

*... for a safer Singapore*



# Fire Safety Requirements for Farm Buildings

# Scope

- ◊ Introduction
- ◊ Types and Characteristics of farm buildings
- ◊ Revised fire safety requirements for farm buildings
- ◊ Conclusion



# Introduction

## Local Agri-Food Tech Sector Outlook

- Food security is a **growing concern**. Local production is especially important to boost our food security.
- Singapore is working towards increasing its local food produce from the current 10 percent to 30 percent of its nutritional needs by 2030. This is to address food security concern through less reliance on food imports and by reducing its vulnerability to supply disruptions.
- Industry to transform; be highly productive and use **sustainable technologies** to grow food with less resource.

TODAY Singapore

MENU ▾

Farm to fork: Local producers to meet 30 per cent of Singapore's nutritional needs by 2030

By KENNETH CHENG



Apollo Aquaculture Group's prototype vertical farm

Published 07 MARCH, 2019

UPDATED 07 MARCH, 2019

SINGAPORE — By 2030, homegrown produce will meet 30 per cent of Singapore's nutritional needs, addressing food security concerns and reducing its vulnerability to supply disruptions.

Home-based producers now meet less than 10 per cent of Singapore's nutritional needs, and the government aims to increase this to 30 per cent by 2030.

Today

Local production contributes **to less than 10%** of Singapore's nutrition needs



By 2030

Local production meets **30%** of Singapore's nutrition needs



# Types and Characteristics of farm buildings

- ▷ Currently, there are **over 200 existing farms** in Singapore.
- ▷ Farming trades – fisheries, vegetables, livestock, eggs and etc.
- ▷ The characteristics of a farm building are influenced by several factors such as **type of produce** and the **climatic conditions** appropriate for the produce.
- ▷ Not all farms adopt the same farming practices, which can result in differing fire safety risks.
- ▷ There are **low-rise conventional type** and also **high-rise farm buildings** with design setup that is akin to factory buildings.



# Why fire protection is required for farm buildings

- △ In the Fire Code, farm buildings are categorised as **Purpose Group VI – Factory** as their setup is akin to a factory where there could be potential production activities within farms such as packaging, handling and processing etc.
- △ Farm buildings need to have a large space and the structures are close together.
- △ It is essential that appropriate fire safety measures are provided to ensure buildings are safe to occupy and to facilitate fire-fighting operations.



In 2017, Greenhouse fire in Pennsylvania, USA. The roof of the building collapse.



In 2012, 500,000 chickens died in a fire at Chicken Egg farm at Denver, USA.



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# Classification of overseas farm buildings

Country	Australia	New Zealand	US	Canada	Sweden	Norway
Building classification	Factory/ storage	Factory/ storage	Group U- Agricultural	Farm building	Factory (Class 1)	Factory/ Storage (Class 2)



# Review of fire safety requirements for farm buildings

- △ SCDF have been providing consultations on farm-related issues
- △ The fire safety requirements for factory are generally deemed more onerous for some farm buildings.
- △ The common issues were fire engine accessway, compartmentation, fire sprinkler system, smoke control system, travel distance, corridor width, use of plastic material, etc.



# **Revised Fire Safety Requirements for Farm Buildings**



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# Important Note

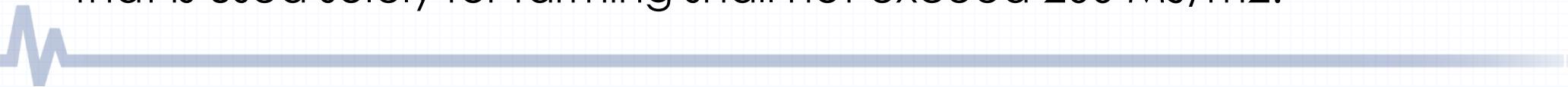
This set of revised fire safety requirements for farm buildings has not been officially come into effect. The effective date shall be in accordance with the circular issues by SCDF which will most likely to be in early Dec 2020.



# Revised fire safety requirements for farm buildings

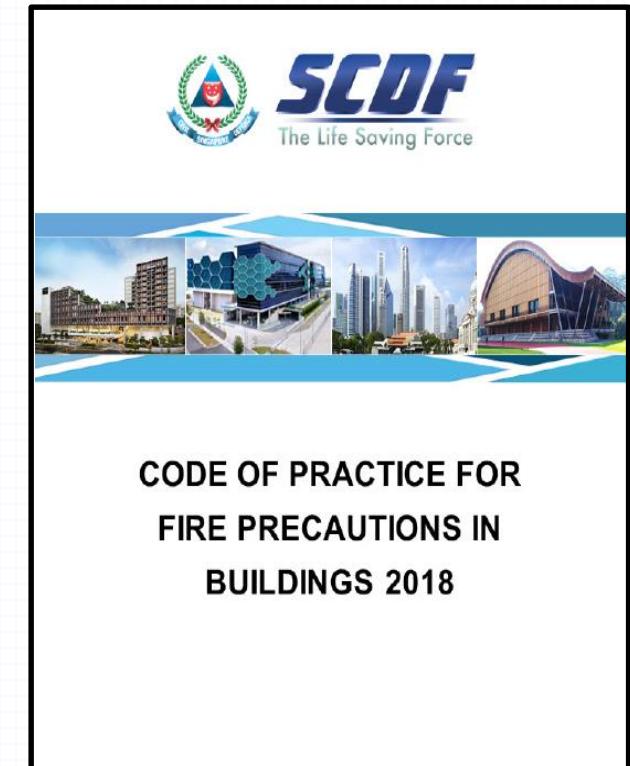
The revised fire safety requirements will be applicable to farm buildings that meet the following criteria:

1. the habitable height of the building **shall not be more than 10m;**
2. the building shall be used for the **sole purpose of farming** (e.g. growing of crops, fish harvesting and egg production) and not involve activities such as packaging, storage and retail;
3. other usages such as packaging, storage, retail, office and non-farming related production can be co-located within the building, provided they are compartmented and comply fully with the respective requirements stipulated in this Code; and
4. the total computed Fire Load Energy Density (FLED) within the compartment that is used solely for farming shall not exceed 200 MJ/m<sup>2</sup>.



# Revised fire safety requirements for farm buildings

1. Occupant Load factor
2. Width of Corridor
3. Travel distance
4. Fire engine accessway
5. Compartmentation size
6. Sprinkler system
7. Smoke Control System
8. Set back due to unprotected opening
9. Emergency voice communication system (EVC) and Fire Command Centre (FCC)
10. External wall construction



# **Occupant load factor**

## **Before**

- △ Occupancy load (OL) factor of **10 (m<sup>2</sup>/pax)**

## **After**

- △ Occupancy load (OL) factor of **30 (m<sup>2</sup>/pax)**

The OL shall be based on the accessible floor area, excluding designated farming areas.



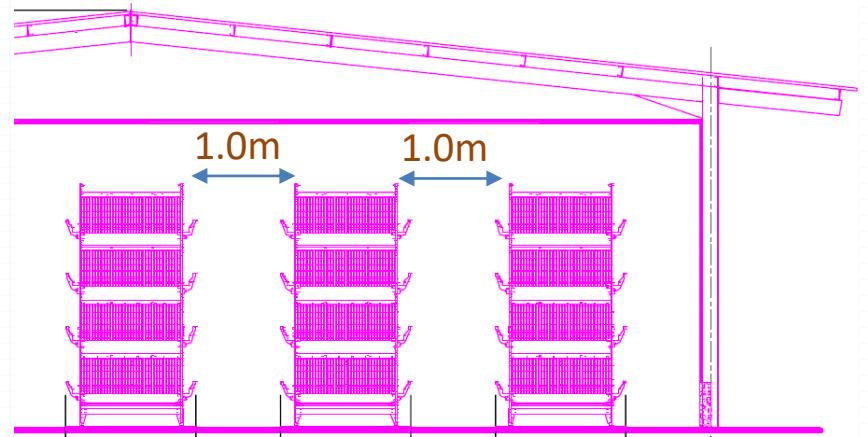
# *Width of Corridor*

## *Before*

- Required width : 1.2m

## *After*

- Required width : 1.0m
  - Allow only if BCA exempts code of accessibility requirements



# *Travel distance*

## *Before*

- ◇ Required TD 1-way 15m and 2-way 30m

## *After*

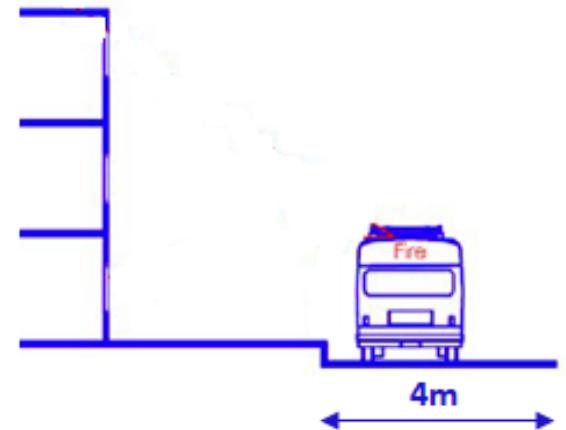
- ◇ Required TD 1-way **25m** and 2-way **60m**

Type of Occupancy	Max Travel Distance (m)			
	One-way travel		Two-way travel	
	Non-sprinklered	Sprinklered	Non-sprinklered	Sprinklered
High hazard	10	20	20	35
Industrial buildings (factories, workshops, godown/warehouse)	15	25	30	60
Shops, healthcare facility (outpatient)	15	25	45	60

# *Fire Engine Accessway*

## **Before**

- Required 6m wide Fire Engine Accessway.



## **After**

- A fire engine accessway is not required, however a **4m** wide fire engine access road for access by firefighting appliances shall be provided to within a travel distance of 60m of every point on the project plan area of the building.

# **Compartmentation size**

## **Before**

- Comply with Table 3.2A : Area:  $\leq 4000 \text{ m}^2$  & Cubical extent:  $\leq 15,000 \text{ m}^3$

## **After**

- Increased : Area (AFA):  $\leq \underline{\text{8000 m}^2}$  & Cubical extent:  $\leq \underline{\text{30,000m}^3}$



# *Sprinkler system*

## *Before*

- Required if exceeds compartment size limit of **4000 m<sup>2</sup>** or **15,000 m<sup>3</sup>**



## *After*

- Required if exceeds AFA of compartment size of **8000 m<sup>2</sup>** or **30,000 m<sup>3</sup>**



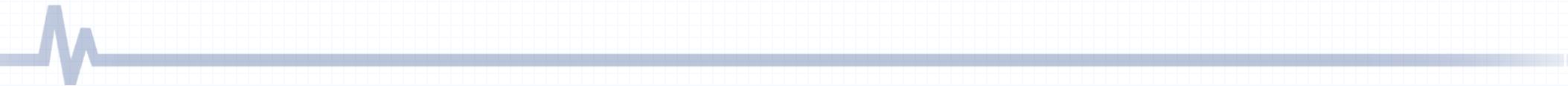
# *Smoke control system*

## **Before**

- Engineer smoke control system (ECS) is required if AFA of compartment size exceeds limit of **5000 m<sup>2</sup>**

## **After**

- ECS is required if AFA of compartment size exceeds limit of **8000 m<sup>2</sup>**



# Setback due to unprotected openings

## Before

- Currently, the setback distance is computed and derived using **Table 2** (used for Shops, Factories & Warehouses)

## After

- To use **Table 1** (used for Residential, Institution, Office, Public Resort & Open-sided car parks)
  - For greenhouse building** - Capped at 6m as height of enclosing rectangle for purpose of computing setback distance

Height of building	Height of enclosing rectangle
< 6m	Building's height
6m or more	6m or height of racking system (whichever is higher)



## **Example of Setback Computation for a Greenhouse**

### **Before**

Based on Table 2 of Annex 3B

Enclosing rectangle : 12m (Height) and 21 m (Width)

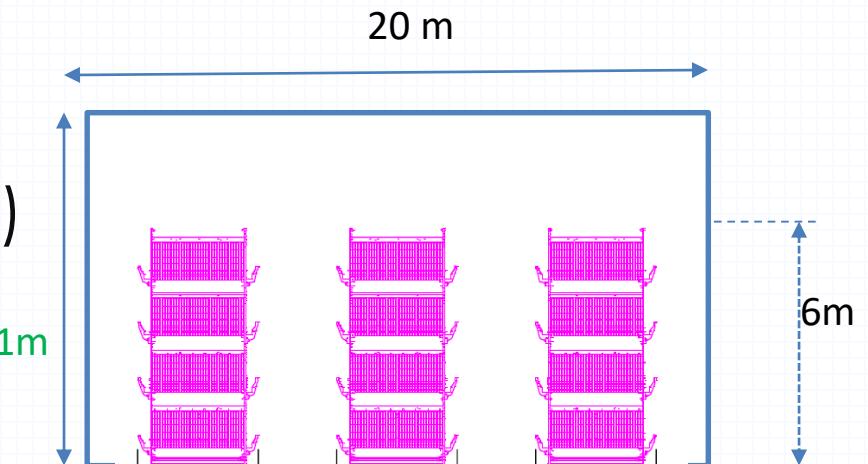
87% openings = 14.7m set back distance required

### **After**

Based on Table 1 of Annex 3B

Enclosing rectangle : 6m (Height) and 21 m (Width)

48% openings = 6.8 m set back distance required



# **External wall construction for greenhouse**

## **Before**

- ◊ Shall be fire rated and non-combustible.

## **After**

- ◊ Allow the use of plastic sheets/shades or nets for greenhouse. The requirements of Cl.3.5.1a.(1) for non-combustibility of external walls need not apply for greenhouse buildings. Where plastic glazing materials are used as screens or shades for a greenhouse, the material shall comply with Table 3.15G.

TABLE 3.15G : PLASTIC WALL OR CEILING MATERIAL/FINISHES			
S/N	Material Construction	Assessment	Remarks
1	Non-combustible material	Allowed	No further fire test required.
2	Material thickness not exceeding 1mm	Allowed	No further fire test required.
3	Use in exit staircase/exit passageways	Not allowed	Key escape routes shall be protected.
4	Material thickness exceeding 1mm	Allowed with conditions	Allowed if pass test categories D, E and F in <u>Table 3.15B</u> , unless specifically exempted for external building applications.



# **Emergency voice communication system & Fire Command Centre**

## **Before**

- EVC is required if the OL exceeds **1000** pax and/or AFA of more than **5000 m<sup>2</sup>**
- FCC is required if building requires fire lift, engineered smoke control (ESC) system, EVC system or OL exceeds **1000** pax and/or accessible floor area of more than **5000 m<sup>2</sup>**

## **After**

- **Exempted.**



# Conclusion

With the nation's drive to expand farming yield from 10 to 30 percent by 2030, an increase in such infrastructure is expected. The review of fire safety requirements for low-rise farm buildings that pegs fire safety requirements with their associated lower fire safety risk is thus timely and appropriate.



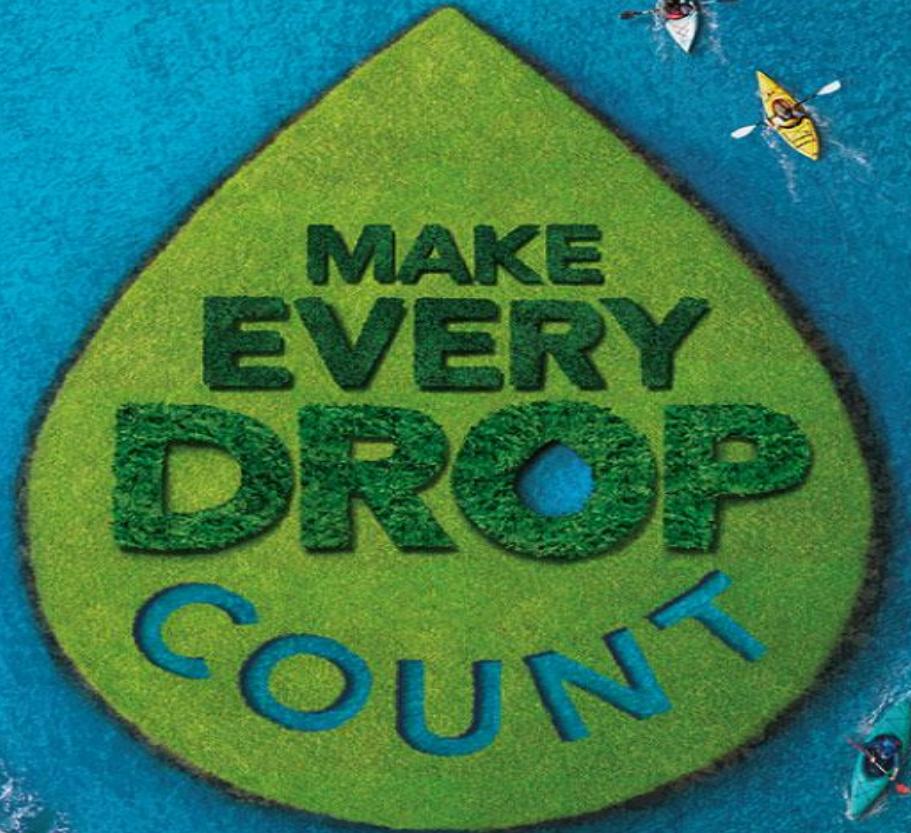
# Thank You



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## Managing Peak Runoff at Source

13<sup>th</sup> Oct 2020



# Outline

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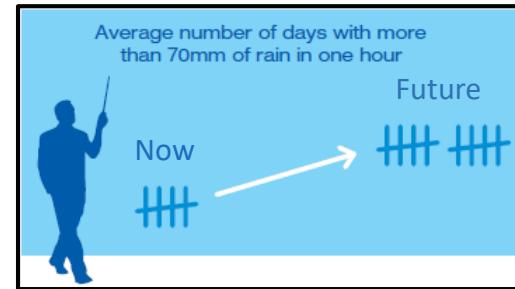
1. Introduction
2. Design Approach
3. Hybrid Systems to Suit Farming Needs
4. Common Issues in Submissions
5. Operations and Maintenance
6. Submission Requirements
7. Post TOP Annual Declaration to PUB
8. Resources

## Introduction

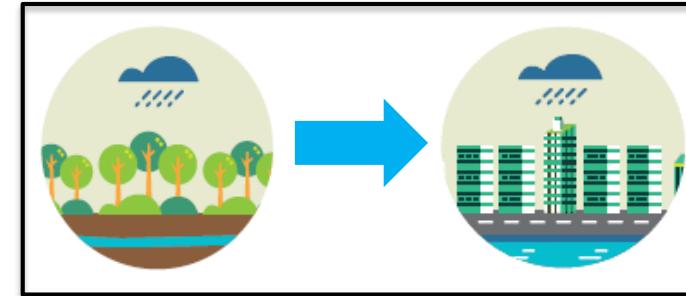
### Increased Peak Flows in Public Drainage Systems



Higher  
Rainfall Intensities



Higher Frequency of  
Rainfall Events

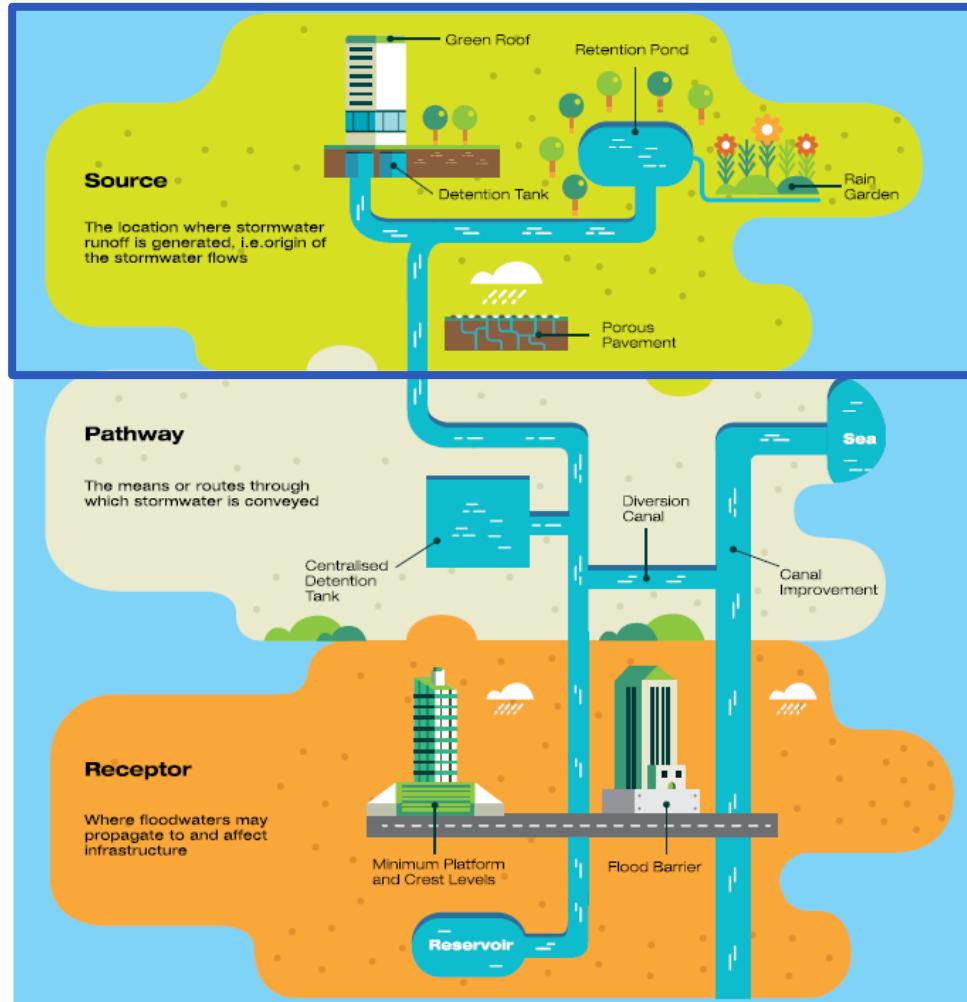


Continued Urban  
Development

Increased Peak Flows in Public Drainage System

# Introduction

## Holistic Stormwater Management – Source Control



- Since 2014, it is mandatory that all new and redeveloped **industrial**, commercial, institutional and residential developments **greater than or equal to 0.2 hectares in size** have to control peak runoff discharged from the development sites (COP CI 7.1.5).
- **Maximum allowable peak runoff** to be **discharged to the public drains** will be calculated based on a **runoff coefficient of 0.55**, and for design storms with a return period of 10 years and for various storm durations of up to 4 hours (inclusive).

## Design Approach

### Calculating Required Detention Volume

1. Identify no. of public drains the development site will be discharging into
2. Determine the site areas (A) and runoff coefficients (C) for each sub-catchment
3. Compute the respective Post-development Runoff and Max. Allowable Runoff for each sub-catchment

#### Post-development Peak Runoff

$$Q_{\text{post}} = CiA/360$$

C: Weighted C  
i:  $8913/(t_c+36)$   
A: Site area

#### Maximum Allowable Peak Discharge

$$Q_{\text{allowable}} = CiA/360$$

C: 0.55  
i:  $8913/(t_c+36)$   
A: Site area

4. Select and design appropriate detention/retention features to hold the additional runoff within the development (if a holding tank is used, it has to be emptied within 4hrs after a rain event).

## Design Approach

### Calculating Required Detention Volume - Example

- Assume development site is discharging into one public drain (single catchment)
- Assume detention system is online with after storm discharge – Full Detention of Runoff Method (Appendix D)<sup>#</sup>
- For a 2 ha site where 1.2 ha is impervious and 0.8 ha is pervious

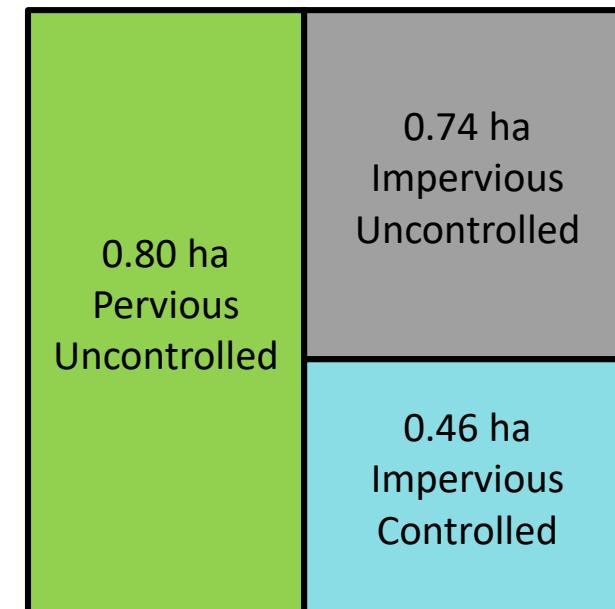
Land Use	Percentage of Site Area	Area	Runoff Coefficient
Impervious surfaces	60%	1.2 ha	1
Pervious surfaces	40%	0.8 ha	0.45

# Note: Please refer to the *On-site Stormwater Detention Tank Systems* technical guide for other types of detention systems

## Design Approach

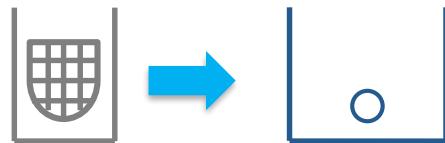
### Calculating Required Detention Volume - Example

- $C_{\text{post}} = (0.6 \times 1) + (0.4 \times 0.45) = 0.78$
- Fraction of site area to be controlled  $= C_{\text{post}} - C_{\text{target}}$   
 $= 0.78 - 0.55$   
 $= 0.23$
- Detention volume  $= 1300 (C_{\text{post}} - C_{\text{target}}) \text{ m}^3/\text{ha} \times 2 \text{ ha} (\text{site area})$   
 $= 1300 \times 0.23 \times 2$   
 $= 598 \text{ m}^3$

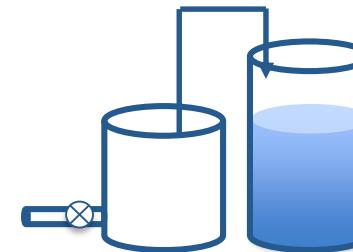


# Hybrid Systems to Suit Farming Needs

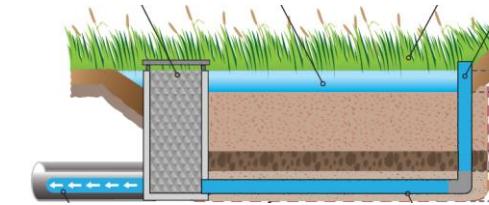
## Alternatives



Larger perimeter drains  
with controlled orifice  
discharge



Combined Rainwater  
Harvesting and Detention  
System

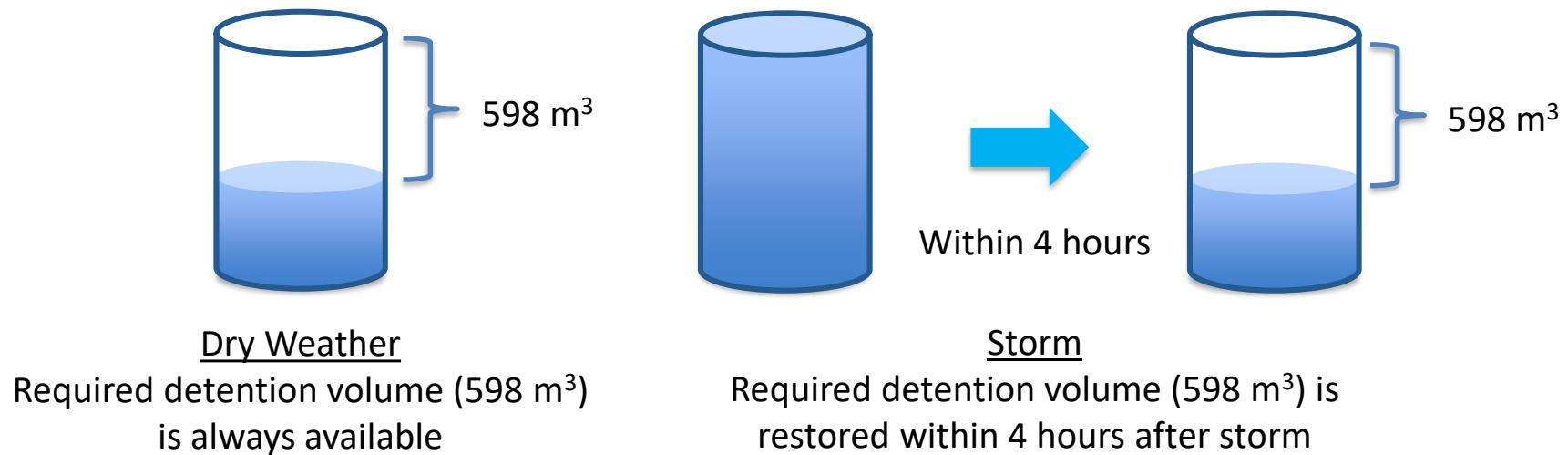


ABC Design  
Features

# Hybrid Systems to Suit Farming Needs

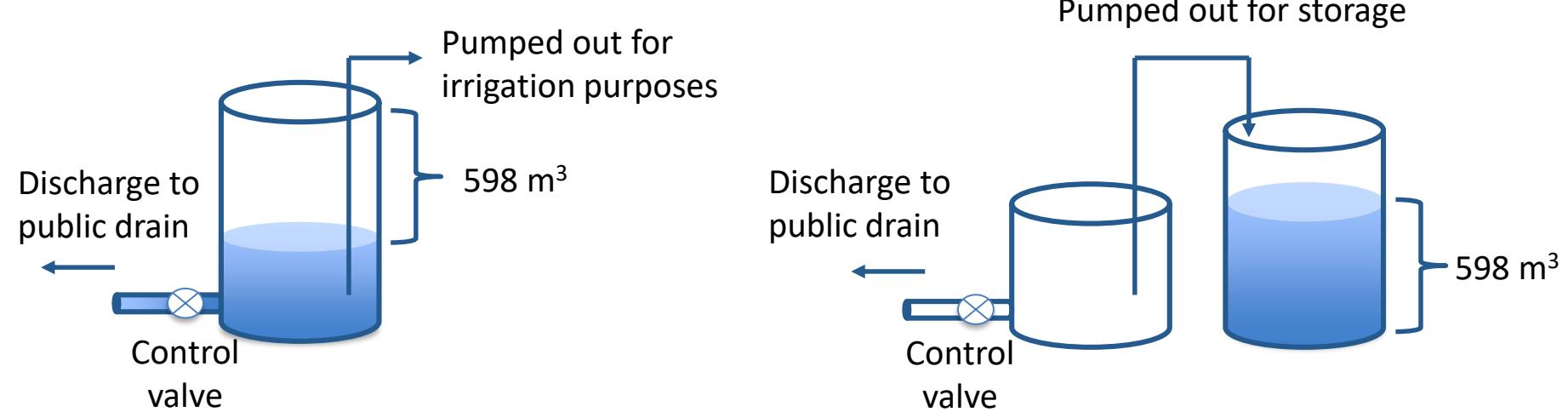
## Combined Rainwater Harvesting and Detention System

- Water is needed for irrigation purposes and stormwater collected can be a source
- A combined rainwater harvesting and detention system can be considered, subject to the following conditions:
  - The required detention volume is independent of the rainwater harvesting volume i.e. the required detention volume shall be available at all times
  - In the event of storm, the required detention volume shall be restored within 4 hours after the storm



# Hybrid Systems to Suit Farming Needs

## Combined Rainwater Harvesting and Detention System – Possible Configurations



## Common Issues in Submissions

- Required detention volume not clearly indicated
- Post-development runoff coefficient ( $C_{post}$ ) not computed correctly
- Breakdown on how  $C_{post}$  was computed not shown

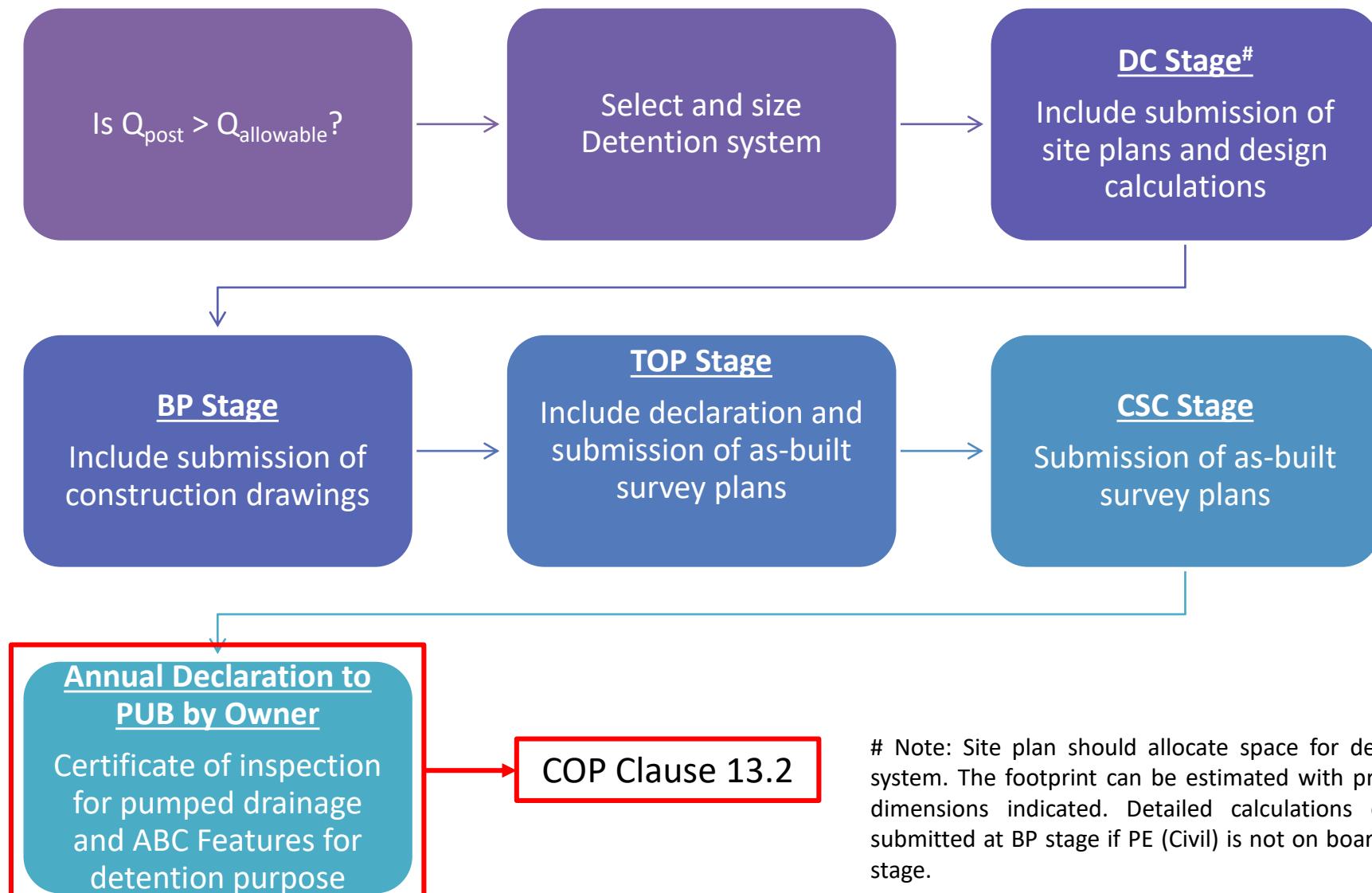
Land Use	Percentage of Site Area	Area	Runoff Coefficient
Impervious Surfaces (rooftops, roads, walkways, swimming pool)	85%	2550m <sup>2</sup>	1.0
Pervious Surfaces (grass, landscaping)	15%	450m <sup>2</sup>	0.45

- Discharge mechanism of detention system not indicated
- Detention tank discharge control/pump operations not included in calculations
  - Calculations stop at detention tank configuration (effective tank depth and tank bottom area for required detention volume)
- Calculations should include proposed orifice diameter and/or pump capacity, and show the following:
  - Discharge rate is <  $Q_{allowable}$
  - Required detention volume can be restored within 4 hours after storm

## Operations and Maintenance

- Regular inspections and maintenance ensure that detention system can function as required during storm
- O&M checklist can be used to guide the inspection and maintenance regime
  - Sample in Appendix F of Technical Guide for On-site Stormwater Detention Tank Systems
- Inspections should be carried out at least once per month and after significant storm events. Things to look out for:
  - Structural integrity of tank
  - Water stagnation
  - Clogging of inlet and outlet
  - Condition of pumps and generators
- General maintenance and servicing of mechanical and electrical equipment should be carried out at least once annually, preferably before year-end monsoon season

# Submission Requirements



# Note: Site plan should allocate space for detention system. The footprint can be estimated with proposed dimensions indicated. Detailed calculations can be submitted at BP stage if PE (Civil) is not on board at DC stage.

# Post TOP Annual Declaration to PUB

## Steps

Developers/owners/MAs are required to make annual declarations to PUB for their storm water drainage systems after TOP is obtained.

1. The developer/owner/MA is required to log in to the BPU online portal to submit the declaration via Singpass
  - a. Section 1: General information on development/building
  - b. Section 2: Particulars of developer/owner/MA
  - c. Section 3: Declaration by developer/owner/MA that a QP has been engaged and the storm water drainage systems are certified to be in working condition
2. The developer/owner/MA is to retain the inspection documents and submit only when requested by PUB
3. A reminder letter will be sent to the developer/owner/MA through the BPU online portal on subsequent years

Note: QPs can fill in the owner's details and email address during DC submission in the DC Corenet form and a reminder will be sent to the owner by BPU online portal.

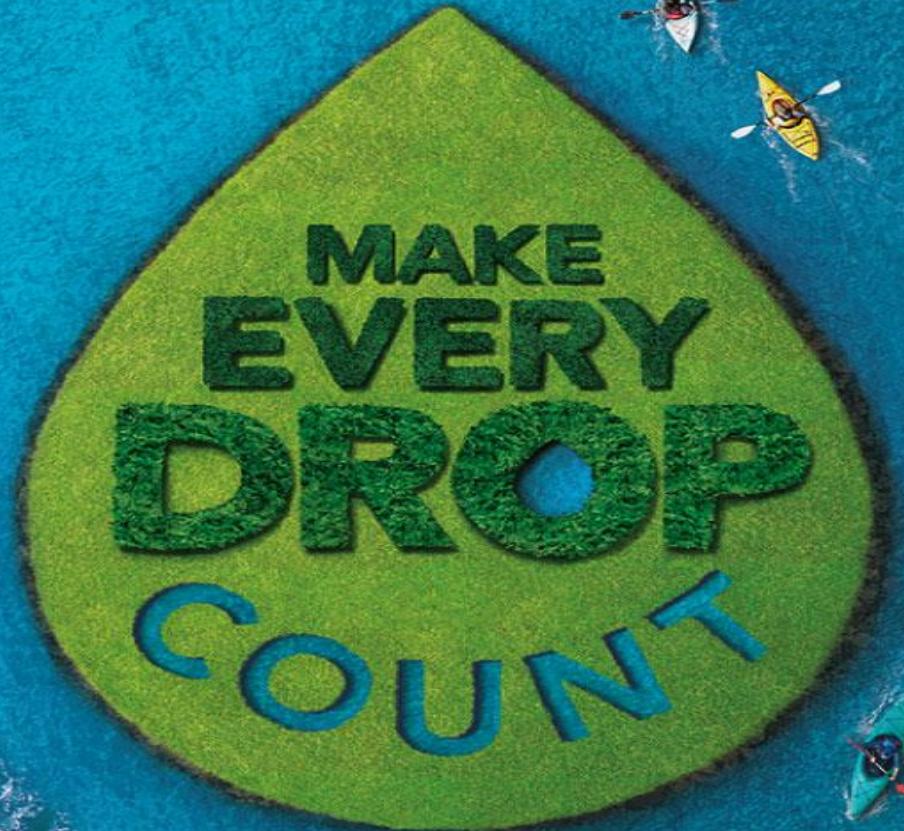
## Resources

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- On-Site Stormwater Detention Tank Systems
  - <https://www.pub.gov.sg/Documents/detentionTank.pdf>
- Condensed Booklet on Engineering Procedures for ABC Waters Design Features
  - [https://www.pub.gov.sg/Documents/Condensed\\_Booklet\\_of\\_Engin\\_Procedures.pdf](https://www.pub.gov.sg/Documents/Condensed_Booklet_of_Engin_Procedures.pdf)
- Guidance Notes for the Application of Rainwater Collection Systems
  - <https://www.pub.gov.sg/Documents/GuidanceNotes.pdf>
- Post TOP Annual Declaration on Storm Water Drainage System
  - <https://bpu.pub.gov.sg/Forms/EForms/Instruction?form=Drainage>

# Best Management Practices for Water Pollution Control at Agricultural Developments Within Water Catchment Area

13<sup>th</sup> Oct 2020



## Protecting our reservoirs in water catchment area with agricultural activities

- Four National Taps for Singapore's water supply:



WATER FROM  
LOCAL CATCHMENT



IMPORTED  
WATER



NEWATER



DESALINATED  
WATER

- Kranji Reservoir is one of the 17 reservoirs in Singapore, and an important source of our water supply.
- Many farms with land agricultural activities are sited within Kranji Reservoir's water catchment area.
  - Rainwater runoff and discharges carrying nutrients will flow into the reservoir.
  - The increase in farming activities, if not properly managed, may result in poor reservoir water quality.
- Important to implement Best Management Practices (BMP) to manage discharges to protect the reservoir waters, while maintaining the sustainability of farmlands.

## How do agricultural activities affect reservoir water?

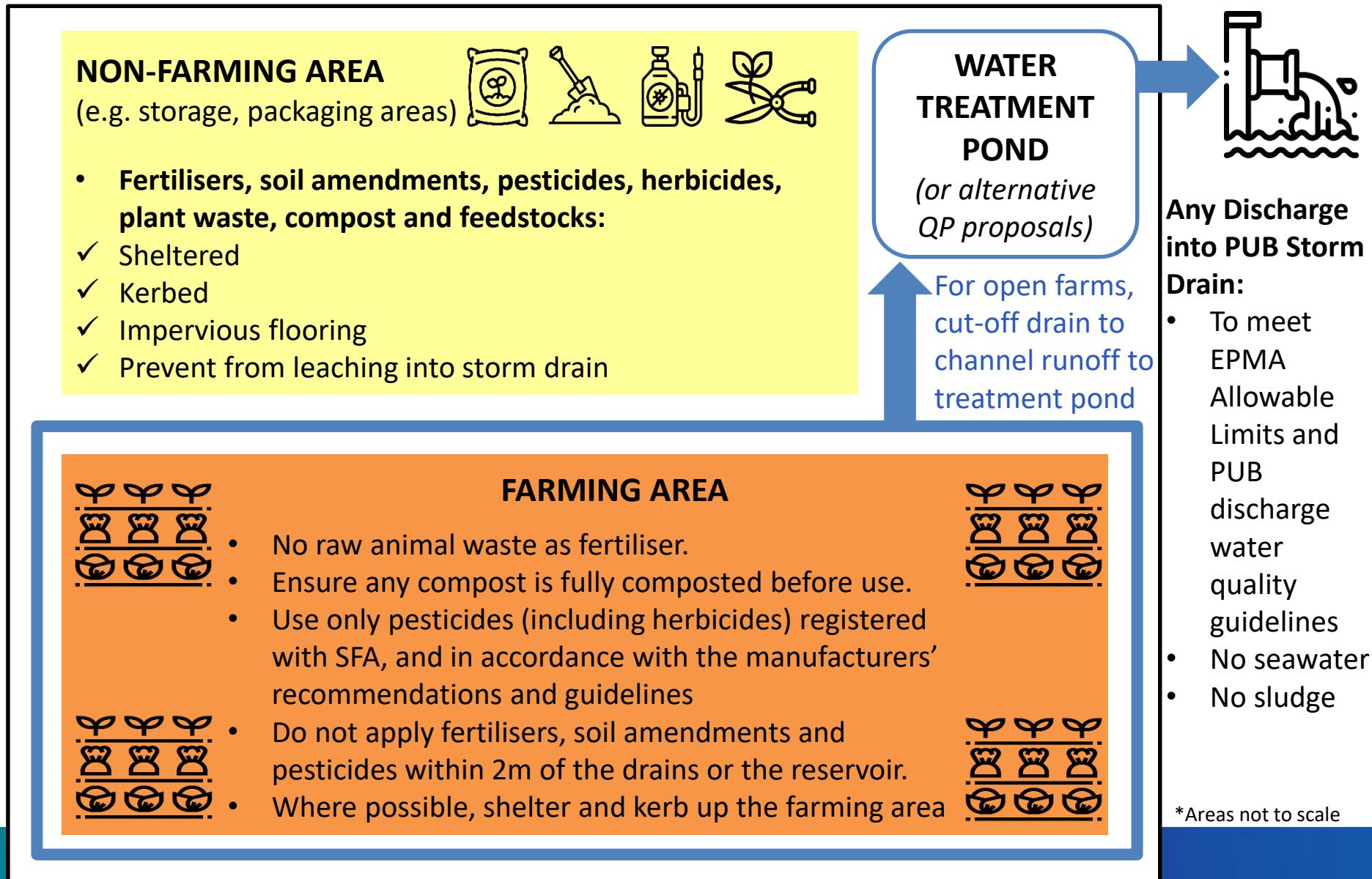
- Primary sources of nutrients include fertilisers and animal waste.
- Poor management of the farmlands may lead to high levels of suspended solids, nutrients (nitrogen and phosphorus) and organics entering the reservoir
  - Potential algal growth and uncontrolled aquatic plant growth
- Pollution control measures need to be implemented at source to prevent the water quality of Kranji Reservoir from being affected in the long run.



## What requirements must the farm meet?

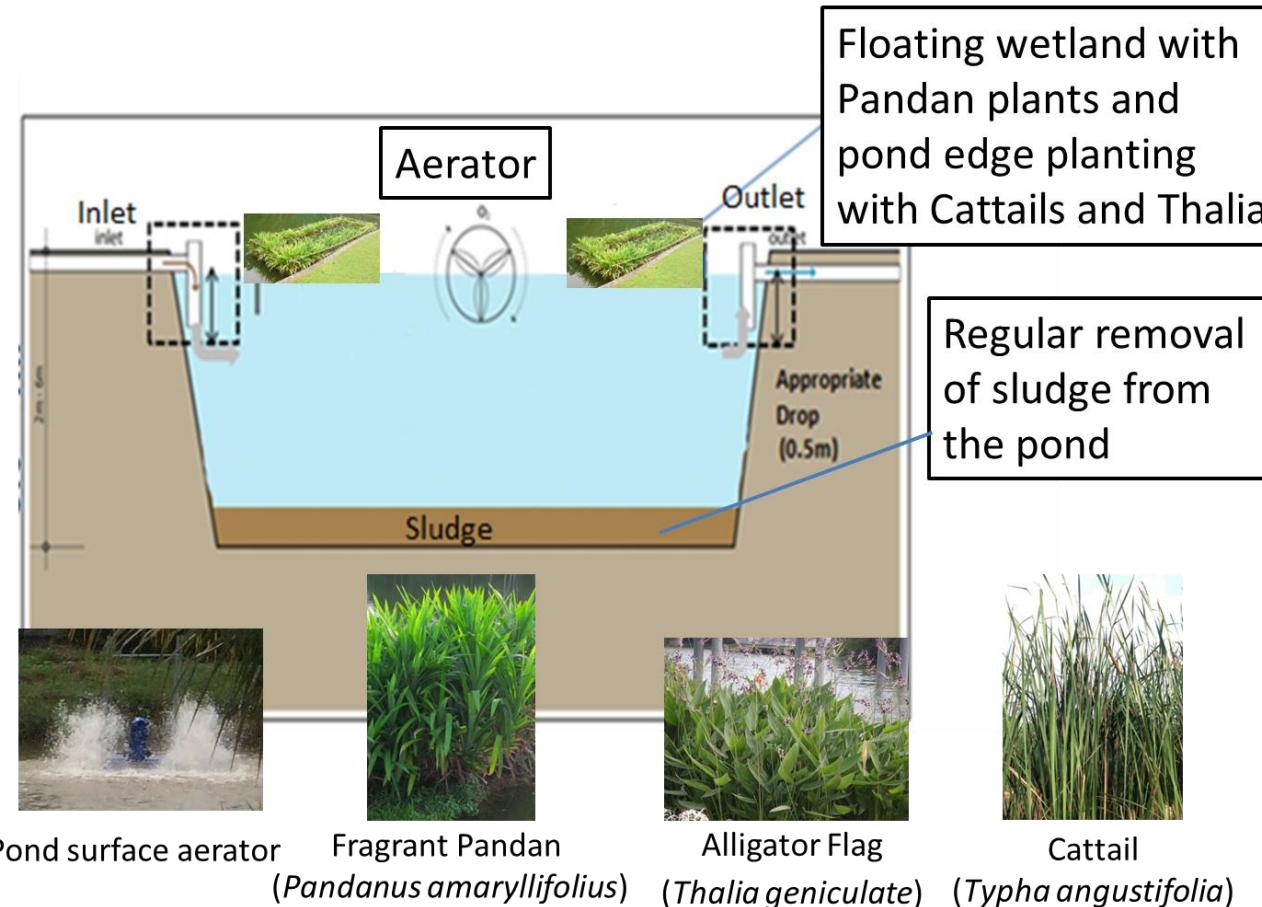
- PUB requires water pollution control measures and BMPs to be incorporated in the design of all farmlands in water catchment areas
- Under the **Environmental Protection and Management Act (EPMA)**, trade effluent discharge into any drain within water catchment must comply with:
  - Water Pollution Control
  - Allowable limits for trade effluent discharge into controlled watercourses
- **PUB's discharge water quality guidelines** for water catchment areas are:
  - Total Nitrogen (TN)  $\leq 10 \text{ mg/L}$
  - Total Phosphorus (TP)  $\leq 0.65 \text{ mg/L}$
  - Total Organic Carbon  $\leq 20 \text{ mg/L}$
  - Ammonia  $\leq 1 \text{ mg/L}$

# What can farms do to protect reservoir water quality?



## A typical treatment pond

Farm owners and Qualified Persons (QPs) can provide alternative proposals on BMPs to meet the pollution control requirements for PUB's evaluation.



## What can farms do to protect reservoir water quality?

### Tanks/basins/ponds for aquatic plants/fish/frog

- Adequate design to ensure no overflow and leakage into the storm drain.
- Prevent any fish/frog waste, dead fish/frog, and plant waste and sludge, from entering the storm drain and reservoir.
- If seawater is used in fish farming, no seawater shall be discharged into the public sewer and storm drain. All used seawater shall be properly collected and disposed off-site.

## What can farms do to protect reservoir water quality?

### Animals (e.g. poultry)

- All animals shall be housed in roofed, enclosed and kerbed sheds with concrete flooring.
- Animal excreta (urine and feces) shall be promptly collected, removed and disposed off-site or treated.
- Any temporary storage of waste awaiting disposal shall be stored under a roofed shed which is kerbed up to contain the wastes.
- All washing activities shall be carried out in covered/roofed areas with concrete flooring and perimeter kerbs to contain all used water, which shall be discharged into a used water collection system.
- No sullage / used water shall be discharged into the storm drain.
- No slaughtering of animals and on-site burial for animal carcasses within the farms.
- No hoofed animals are allowed in water catchment areas.

## What are the benefits of implementing BMPs?



Source: NParks

Cut-off drain channels rainwater runoff to the water treatment pond and pond water can be used for irrigation



Source: SFA



Source: SFA

**Sheltered vegetable plots** help to contain nutrients and retain moisture to support plant growth



Source: NParks

Good housekeeping allows optimal use of plot space

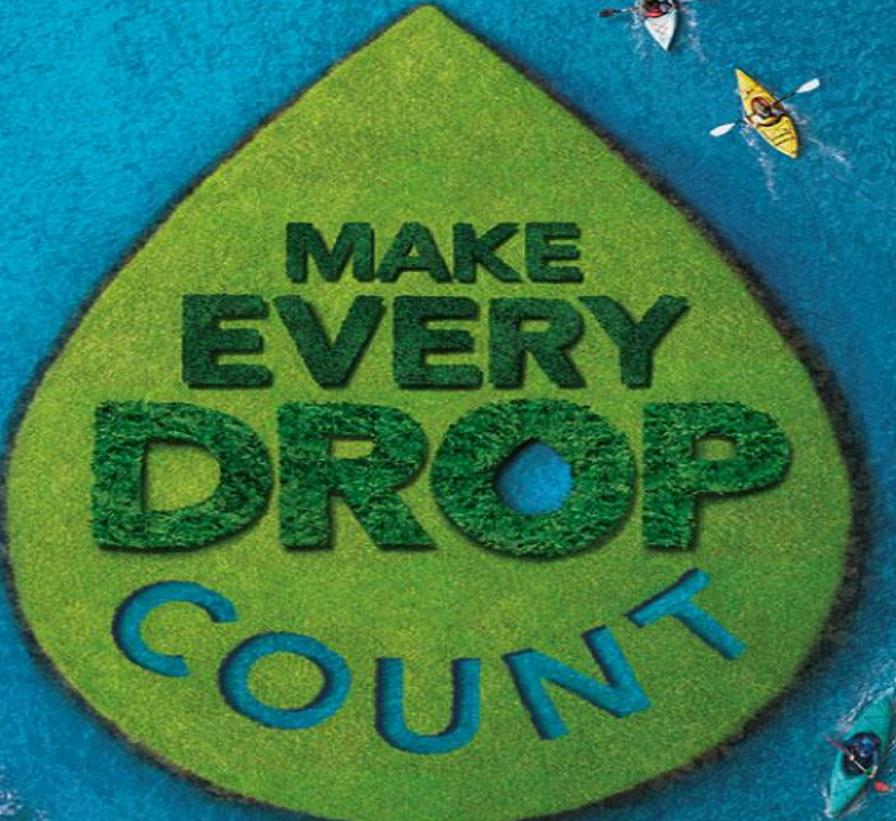
Use only **pesticides and herbicides approved by SFA** to ensure food and environmental safety



Source: PUB

Growing wetland plants in the water treatment pond allows a more environmentally sustainable treatment process as compared to chemical treatment of nutrient-rich runoff

Thank You



MAKE  
EVERY  
**DROP**  
COUNT

