Water Safety Plan Workshop

Saudi Water Forum

Typical Water Safety Model

Too Late!!!

Introduction

Why do we need WSPs?

- In developed
outbreaks in tl
New Zealand,

Camelford water poisoning

The Camelford poisoning: black water, a driver's mistake and 'terrible' advice

GN7A9

An inquest into a woman's death from a rare brain disease has provided insights into Britain's worst modern water poisoning

Steven Morris

@stevenmorris20

Wed 14 Mar 2012 12.36 GMT

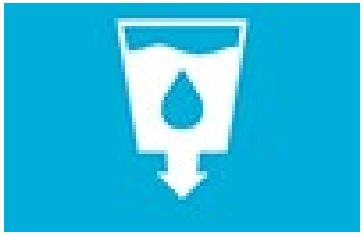
18

This article is over 6 years old

GN7A9

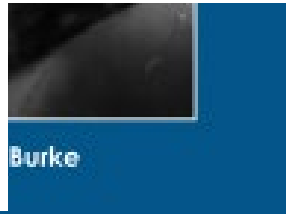
Lead in th America's water beca drink

A century-old engineering decision has led to a modern-day water crisis in US.



Sydney's water supply there has been no significant increase in sickness. This is likely to be explained by recent studies showing that many of the organisms were dead.

Following investigation I have concluded that some of the possible causes of the contamination are unlikely. It is, however, not possible for me to reach a firm conclusion as to the cause of the events until further investigations that I have commissioned have been concluded.

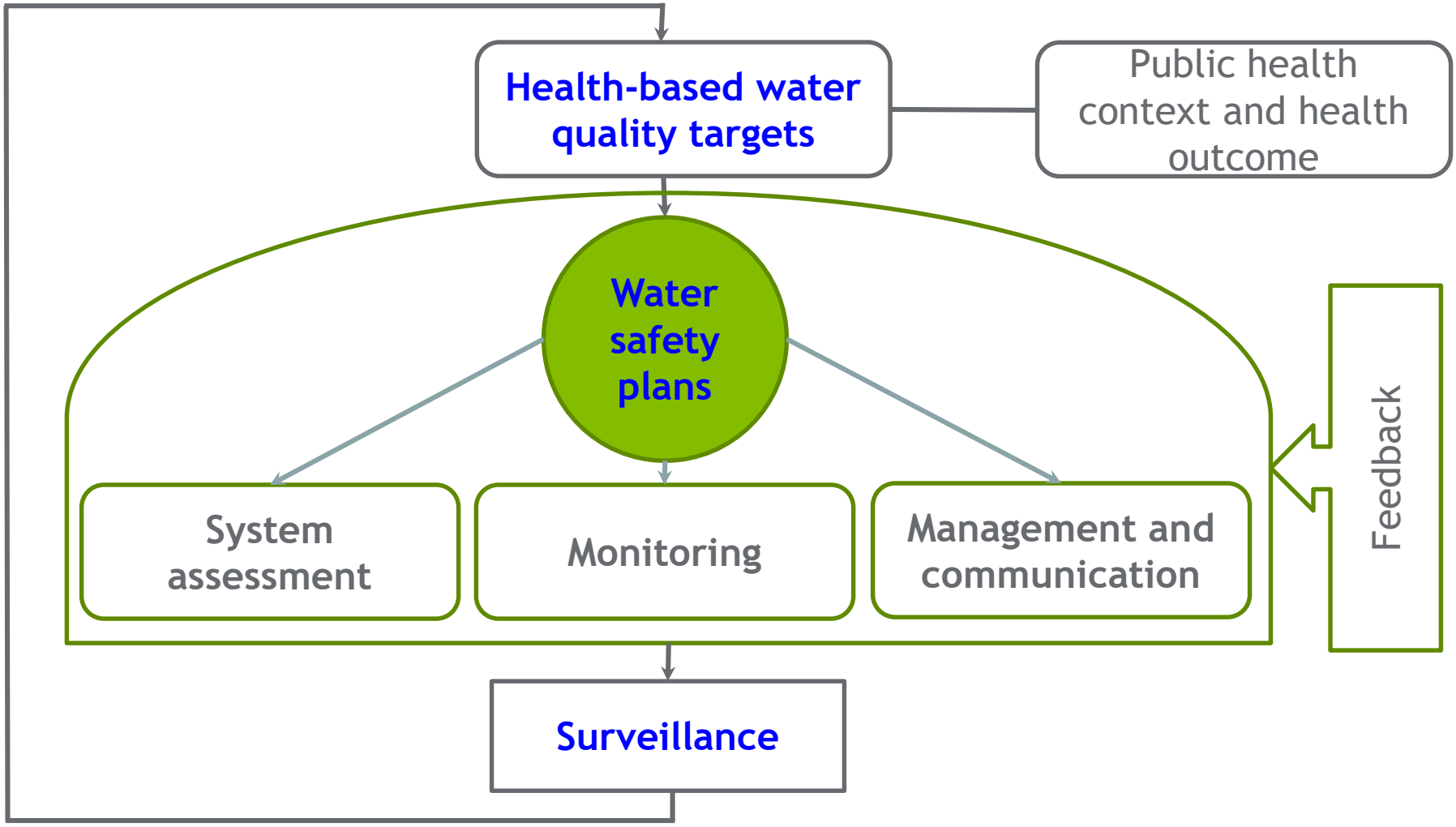


Introduction

Background

- HACCP principles
- Multi-barrier approach
- IWA Bonn Charter
  - Bonn Charter, 2004 “to provide good safe drinking water that has the trust of the consumers”
  - Integrated and proactive approach for entire system
- WHO
  - 2004 - Guidelines for Drinking-water Quality, 3rd Edition
  - Water Safety Plans – risk management from catchment to consumer
  - 2011 - Guidelines for Drinking-water Quality, 4th Edition

Introduction Framework for safe drinking-water



Introduction

What is a Water Safety Plan?

A comprehensive risk assessment and management approach that covers all the steps in water supply, from source to consumer.

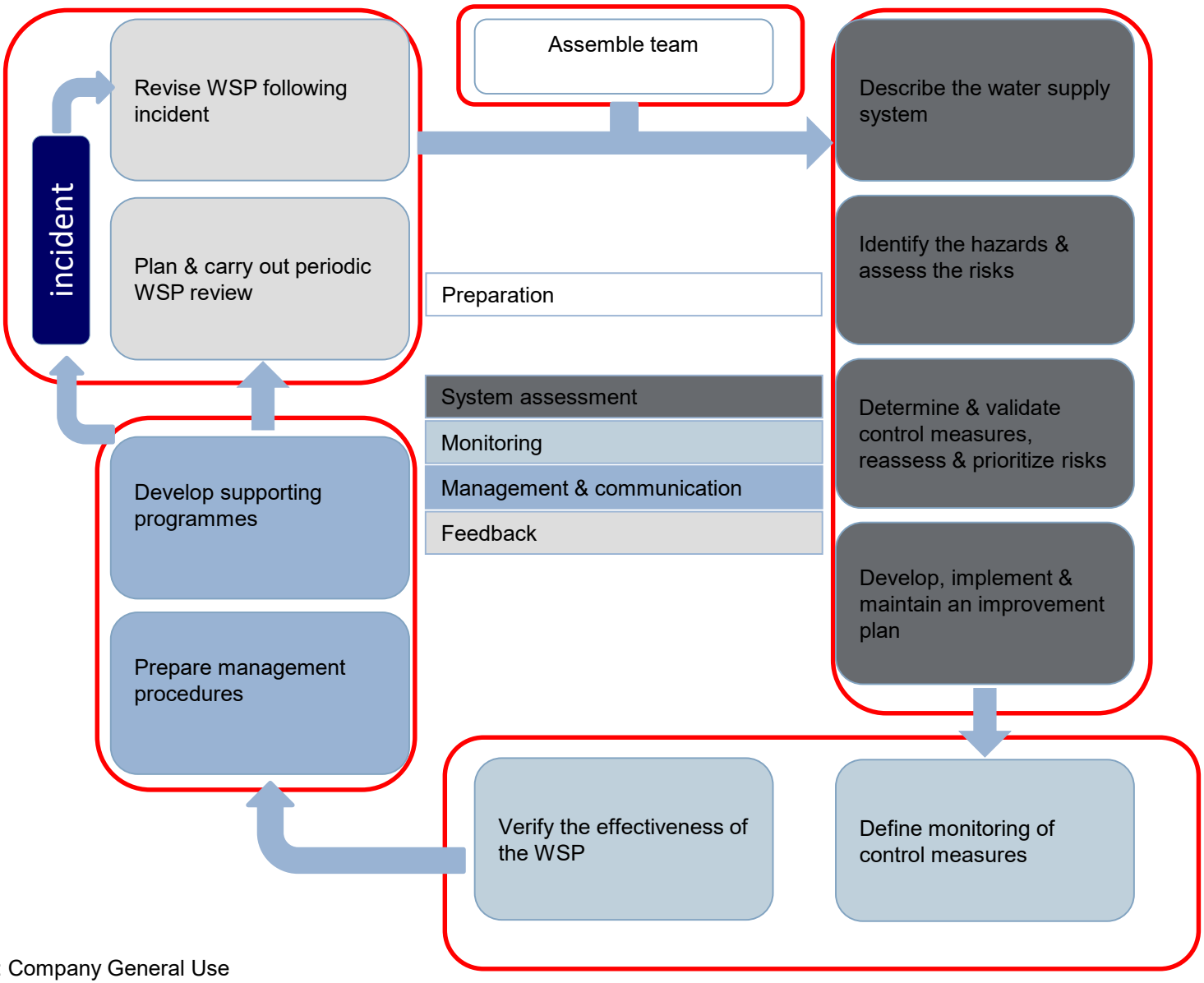
Introduction

What is a Water Safety Plan supposed to accomplish?

Ensure safe drinking water by:

- Understanding the system thoroughly
- Identifying where and how problems could arise
- Establishing barriers and management systems to stop the problems before they happen
- Making sure all parts of the system work properly

Introduction Overview of WSPs



Introduction

WSP approach

- **Should address all components of a water supply**
- **Will vary in complexity according to situation**
- **Objectives:**
  - Minimize contamination of source water
  - Reduce or remove contamination by treatment
  - Prevent contamination during storage, distribution and handling

Introduction Overview of WSPs

WSP approach

- **Safety is secured through a multi-barrier approach**
- **Key control points are known and monitored effectively**
- **Does not necessitate starting over:**
  - Build on existing procedures
  - Continuous improvement
  - Transparent and shared experience with all stakeholders

Introduction

Benefits of a WSP

Utilities

- Clearer understanding of roles and responsibilities
- Helps to prioritize limited resources most effectively
- Reduced costs

Consumers

- Increased confidence in water supply
- Safer water

Regulators

- Clear risk-based targeting and justification of investment
- Anticipates future regulatory agenda

Introduction

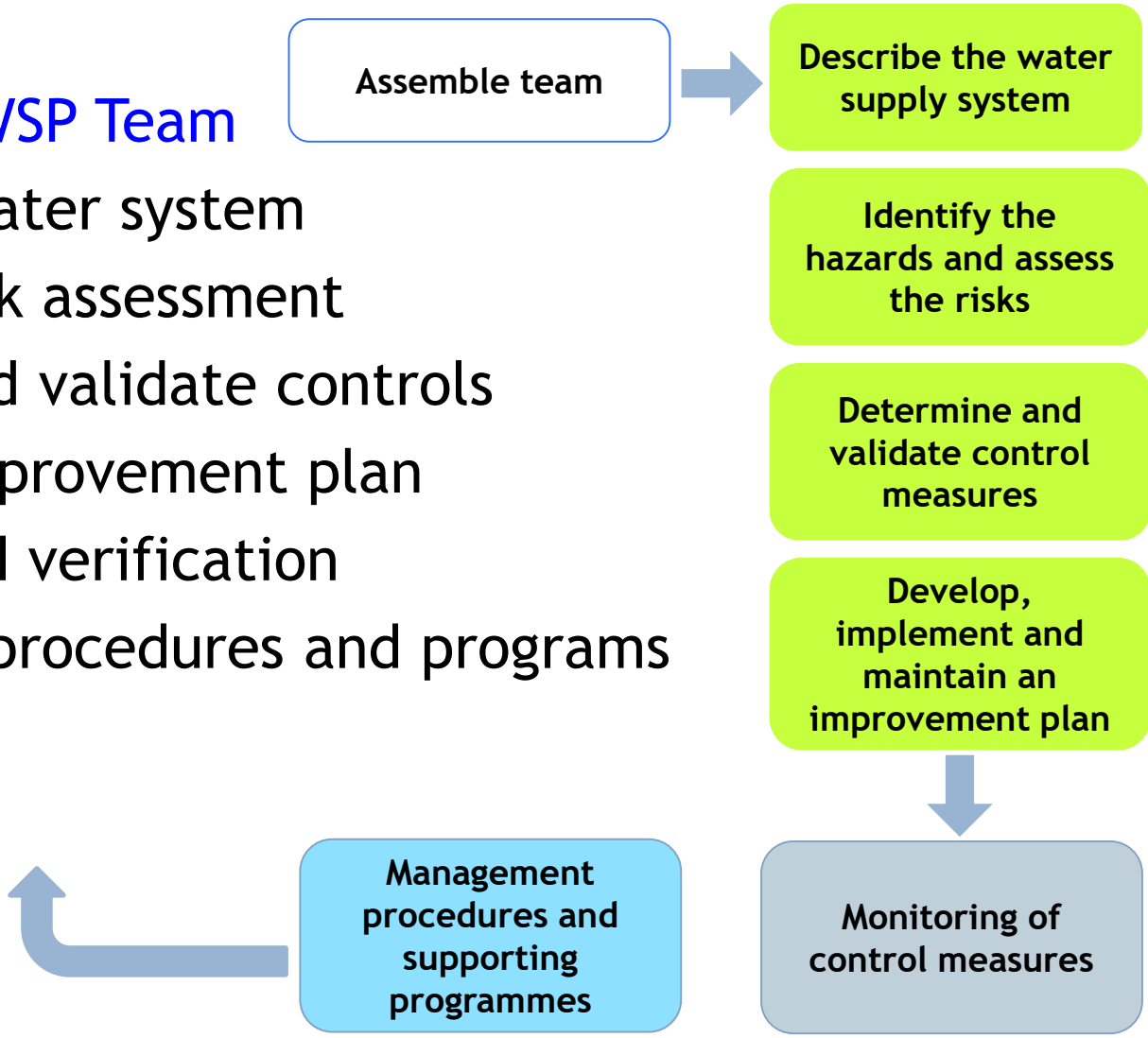
Requirements

- Management commitment
- Suitable WSP team (experts from catchment to point of use)
- Competent and trained staff
- “Right” organizational culture

Water Safety Plan Process

WSP Tasks

1. Assemble WSP Team
2. Describe water system
3. Perform risk assessment
4. Identify and validate controls
5. Develop improvement plan
6. Control and verification
7. Document procedures and programs
8. Review



Assemble WSP Team

- Identify required expertise
  - Hazard identification and risk assessment
  - Understanding of the health-based targets to be achieved
  - Expertise to confirm whether the system can meet relevant standards
  - Knowledge of the supply chain

Assemble WSP Team

Engage senior management

Identify required expertise

Define time frame

Define roles and responsibilities

Assemble WSP Team

- This team should include specialists and points-of-contact for:
  - Raw water source
  - Potable water treatment processes
  - Distribution networks
  - Operations management & procedures
  - End users / customers
  - Any others?

Assemble WSP Team

Exercise 1: Assemble the Water Safety Plan team.

In groups…

Who should be on your WSP team?

- Identify job function and organization.
- Describe the needed competence of that employee.
- Assign the WSP role he/she will assume on the team.

Add your dream team to the flipchart.

Present Outcomes

Water Safety Plan Process

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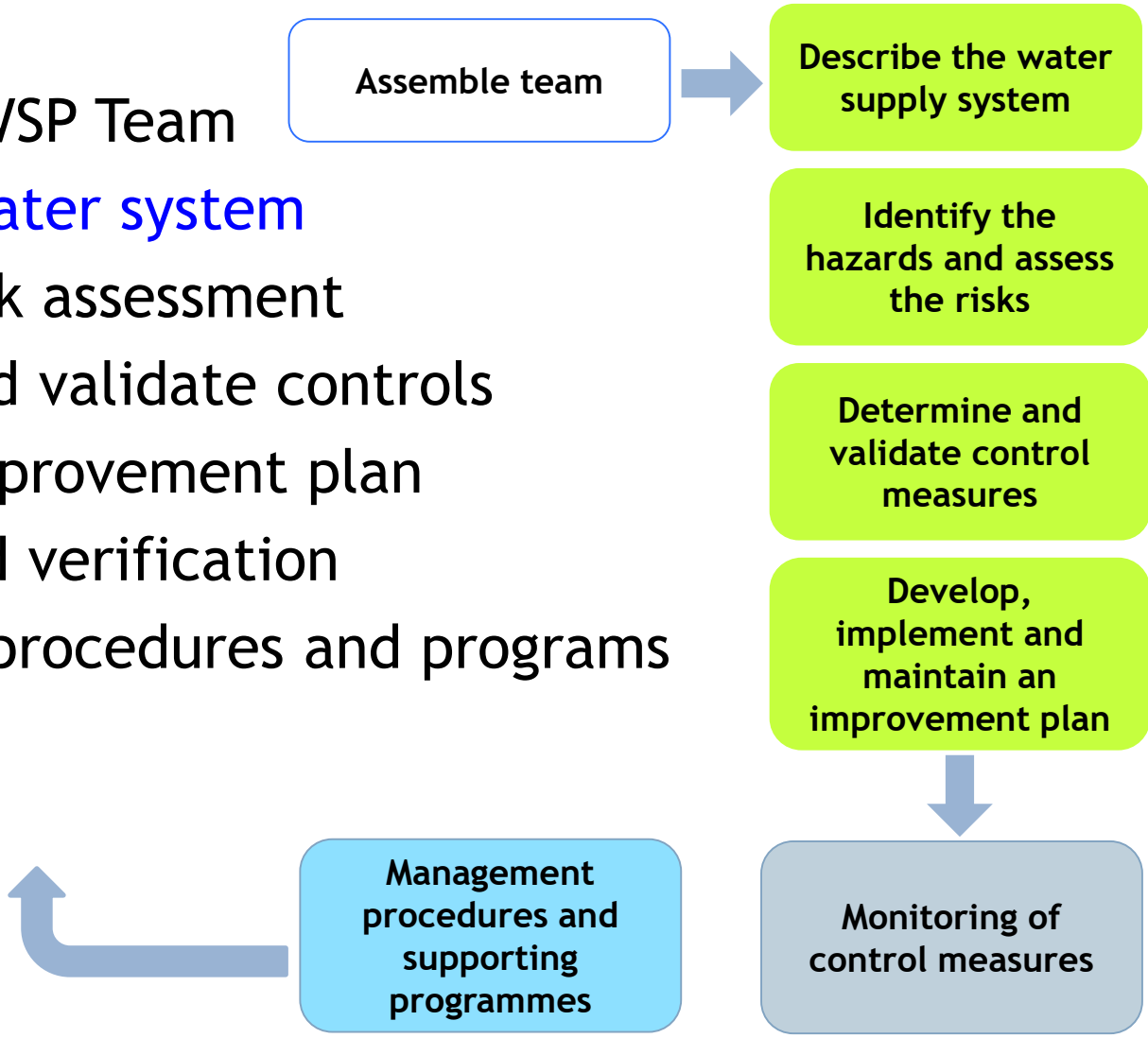
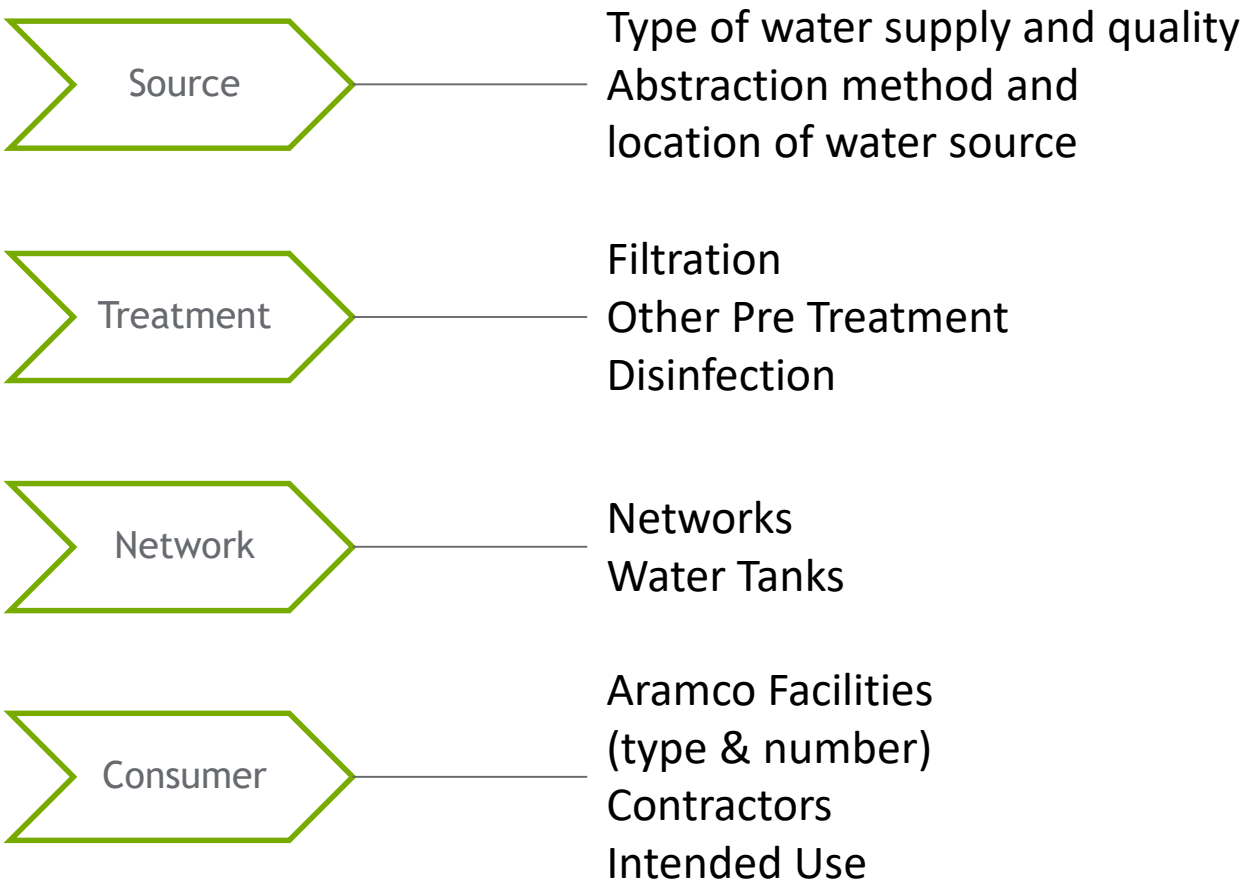


Describe water system

- When the water producer does not already have detailed information on the potable water supply chain, field investigations will be necessary.
- Necessary to enable risks to be assessed and managed
  - Involves field investigations and local knowledge
  - Each system should be assessed on its own
  - Involves documentation, review and update of information, if needed.
- It should provide sufficient information to identify relevant types of hazards, and control measures.

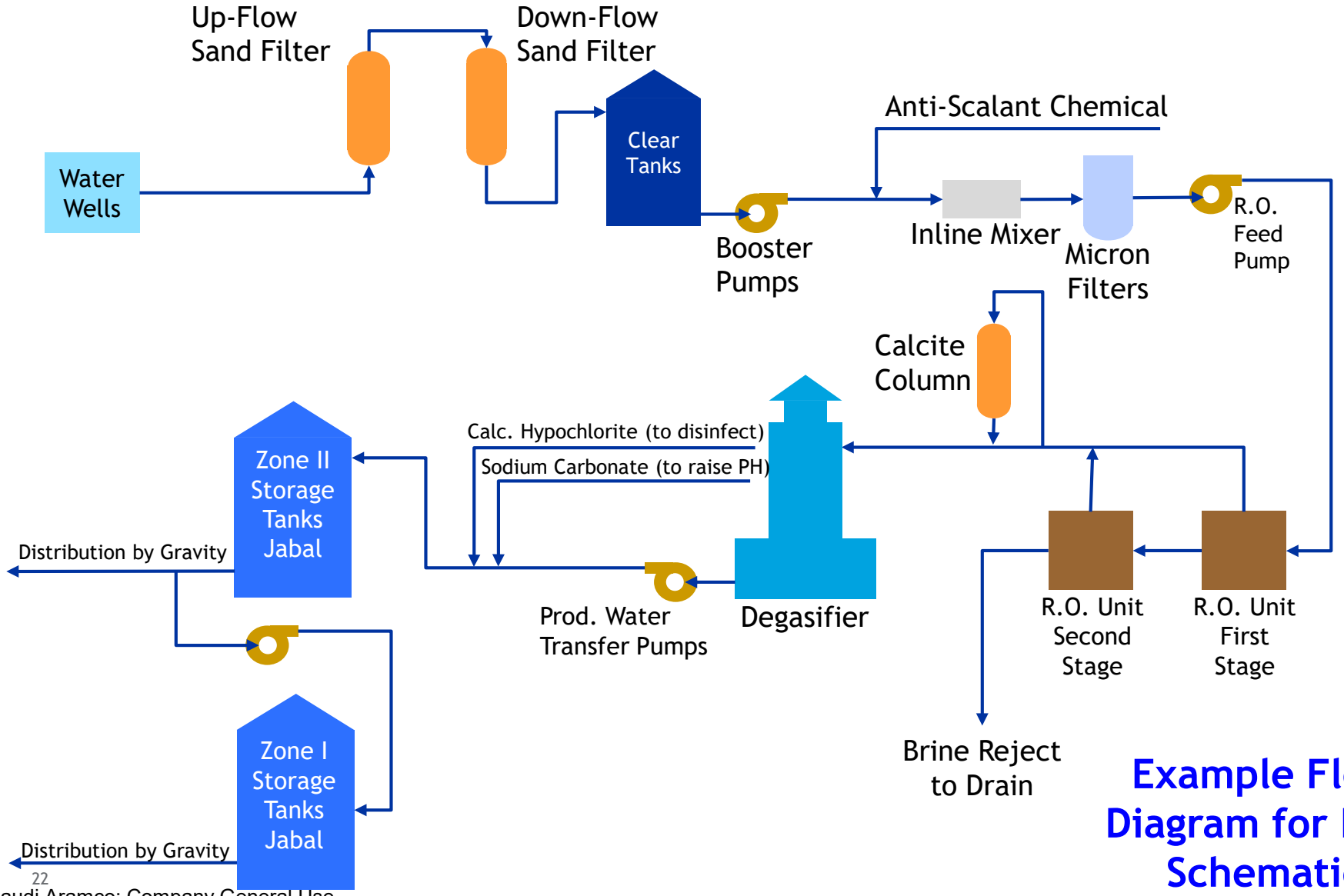
Describe water system



Describe the Water System

- Intended use:
  - General consumption (Drinking)
  - In foodstuff for cooking
  - For bathing and laundry
- End users
  - Employees in offices / buildings
  - Families in community
  - Contractors in their camps
  - Clinics

Describe the Water System



Example Flow Diagram for R.O. Schematic

Describe the Water System

Exercise 2: Identify details of the water supply system.

In groups…

For each of the 4 items assigned to your group:

- Identify the documents and/or resources from which these details can be extracted and/or confirmed.
- Identify the contact organizations responsible for providing/verifying the information.

Water Safety Plan Process

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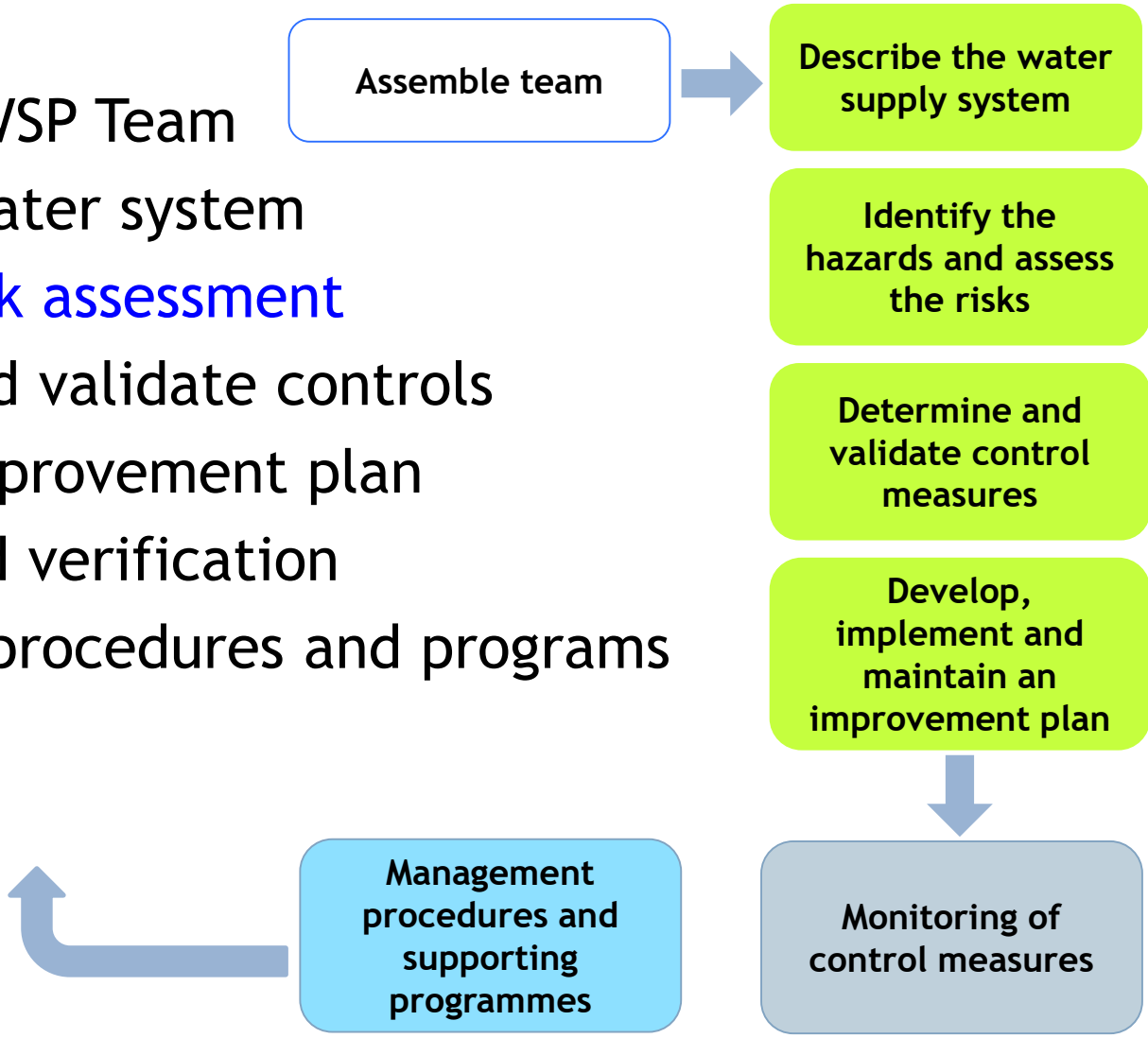


Perform risk assessment

Risk Assessment

- Assess the likelihood (i.e. level of risk) of each identified hazard and consequences (i.e. the severity) of the effect.
- Rating system to rank the risks to assist with creating the improvement plan.

Perform risk assessment

Hazard vs Risk

- A Hazard is…
  - anything that may cause harm, such as pathogenic bacteria, viruses, and chemicals, etc.

- The Risk is…
  - the chance, high or low, that somebody could be harmed by the hazard, together with an indication of how serious the harm could be.

Perform risk assessment

Hazard and Risk Example:

The lion poses a hazard to humans because it has the potential to attack and harm or kill us. Depending on the situation the risk of attack can be likely/high.

Perform risk assessment

Hazard Identification

- Identify potential hazards at each stage of the potable water supply chain.
- Based on site visits, water monitoring data, lessons learned, or knowledge and experience from within the WSP team.

	Possible hazardous events
Source	• MTBE contamination from cracked well casing • Elevated TDS levels year after year
Treatment	• Inadequate treatment for Raw Water contaminants • Inadequate distinction
Network	• Vandalism • Burst mains • Drop in pressure contaminating supply via leaking pipe
Consumer	• Backflow • Unauthorized connections

Perform risk assessment

Risk Categorization

Likelihood or frequency	Severity or Consequence: Insignificant or no impact – Rating: 1	Minor compliance impact – Rating: 2	Moderate aesthetic impact – Rating: 3	Major regulatory impact – Rating: 4	Catastrophic public health impact – Rating: 5
Almost certain Once a day – Rating: 5	5	10	15	20	25
Likely Once a week – Rating: 4	4	8	12	16	20
Moderate Once a month – Rating: 3	3	6	9	12	15
Unlikely Once a year – Rating: 2	2	4	6	8	10
Rare Once every 5 years – Rating: 1	1	2	3	4	5

Risk score	<6	6-9	10-15	>15
Risk rating	Low	Medium	High	Very high

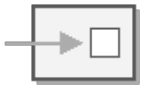
Perform risk assessment

Challenges to Risk Assessment

Not being aware of and/or missing hazardous events or hazards

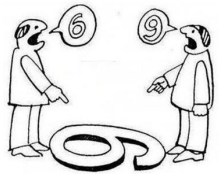
Must be continually reviewed

Risk assessment uncertainty or inconsistency



Defining likelihood and consequences

Too much or too little data



Different opinions within the team

Perform risk assessment

Perform a risk assessment as part of the Water Safety Plan.

In groups…

15 minutes

Present Outcomes

Using the WSP Risk Assessment Matrix, assess one of the four Water Safety Plan areas (source, treatment, network, consumer)

- Identify at least 5 applicable hazards for your assigned area.
- Assess each hazard.
- Assign a likelihood score and a consequence score, risk score, and label H, M, or L.

Prioritize your risks based on the hazard and risk score. Rank all, and justify your top three risks. Add to flipchart.

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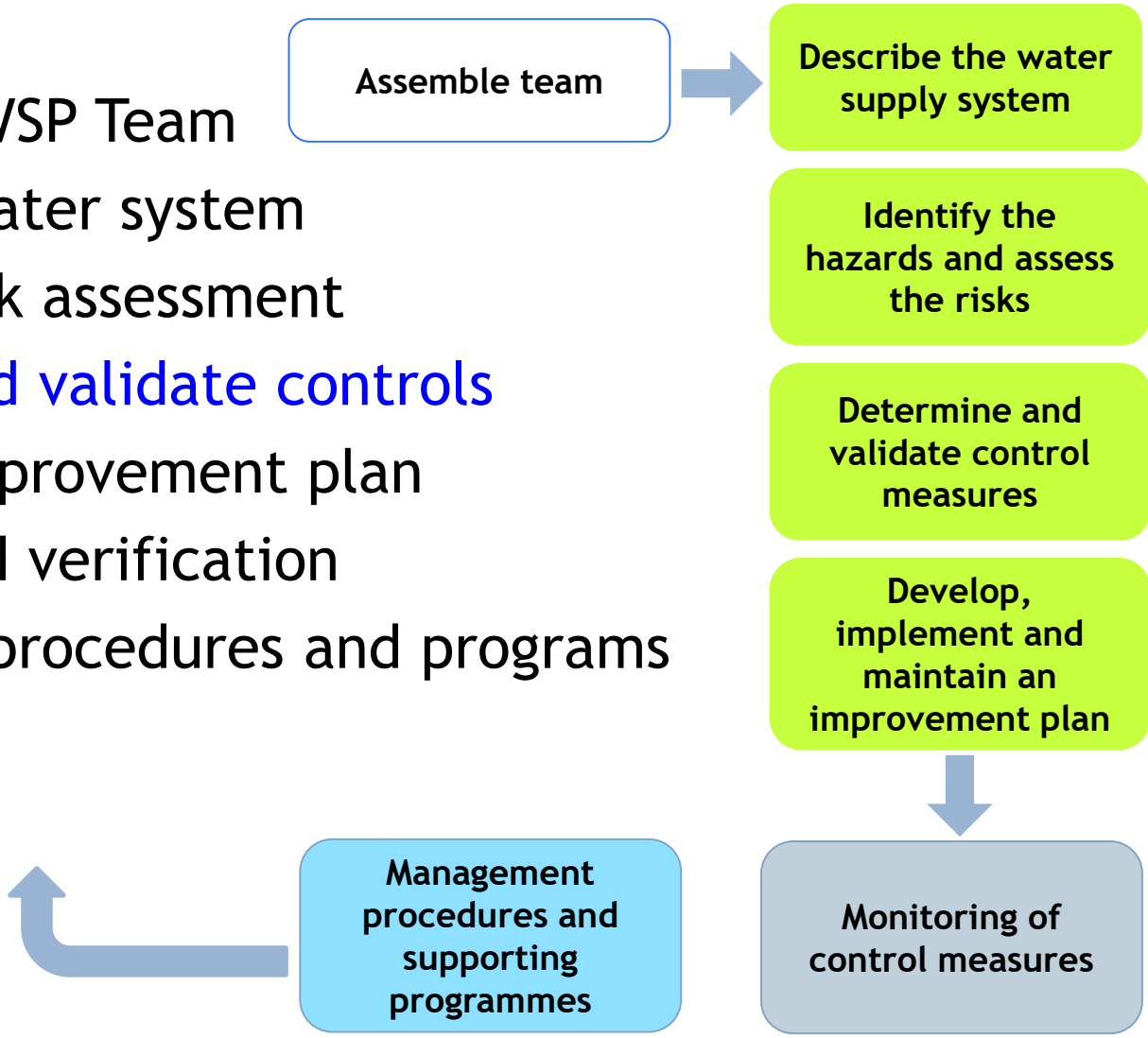


Identify and Validate Control Measures

- Control measure
  - Any action or activity that can be used to prevent, eliminate or reduce to an acceptable level any water safety hazard

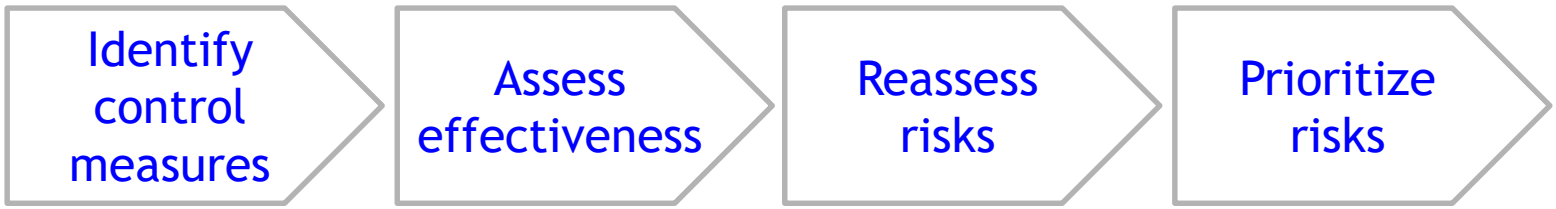
Identify and Validate Control Measures

Example Control Measures

	Possible hazardous events
Source	• Restricted access to wells • Raw water storage
Treatment	• Automated chlorine dosing • Alarmed operating limits
Network	• Flow meters • Trained staff (operator competency)
Consumer	• Property inspections • Non-return valves (Backflow prevention)

Identify and Validate Control Measures

- **Identify existing controls**
- **Document need for new control measures as necessary**



Identify and Validate Control Measures

Actions continued...

- **Assess effectiveness (normal & exceptional circumstances)**

Validation

Investigative activity to identify the effectiveness of control measures. It provides the evidence that elements of the WSP can effectively meet the water quality targets.

Identify and Validate Control Measures

Actions continued...

- **Assess effectiveness (normal & exceptional circumstances)**
  - Monitoring
  - Not in isolation but as part of process chain
  - Data from studies / historical records
  - Introducing contaminant – testing removal
  - Sanitary surveys

Identify and Validate Control Measures

Actions continued...

- **Reassess risks accounting for effectiveness of control measures**
  - Based on long-term average performance
  - Highlight where controls are not in place

Identify and Validate Control Measures

Challenges

- **Uncertainty in prioritizing risks**
  - Lack of knowledge
  - Poor data
  - Different approaches = different outcome
    - Qualitative versus quantitative
- **Assessing effectiveness of certain controls**
  - Catchment – how to measure/enforce?

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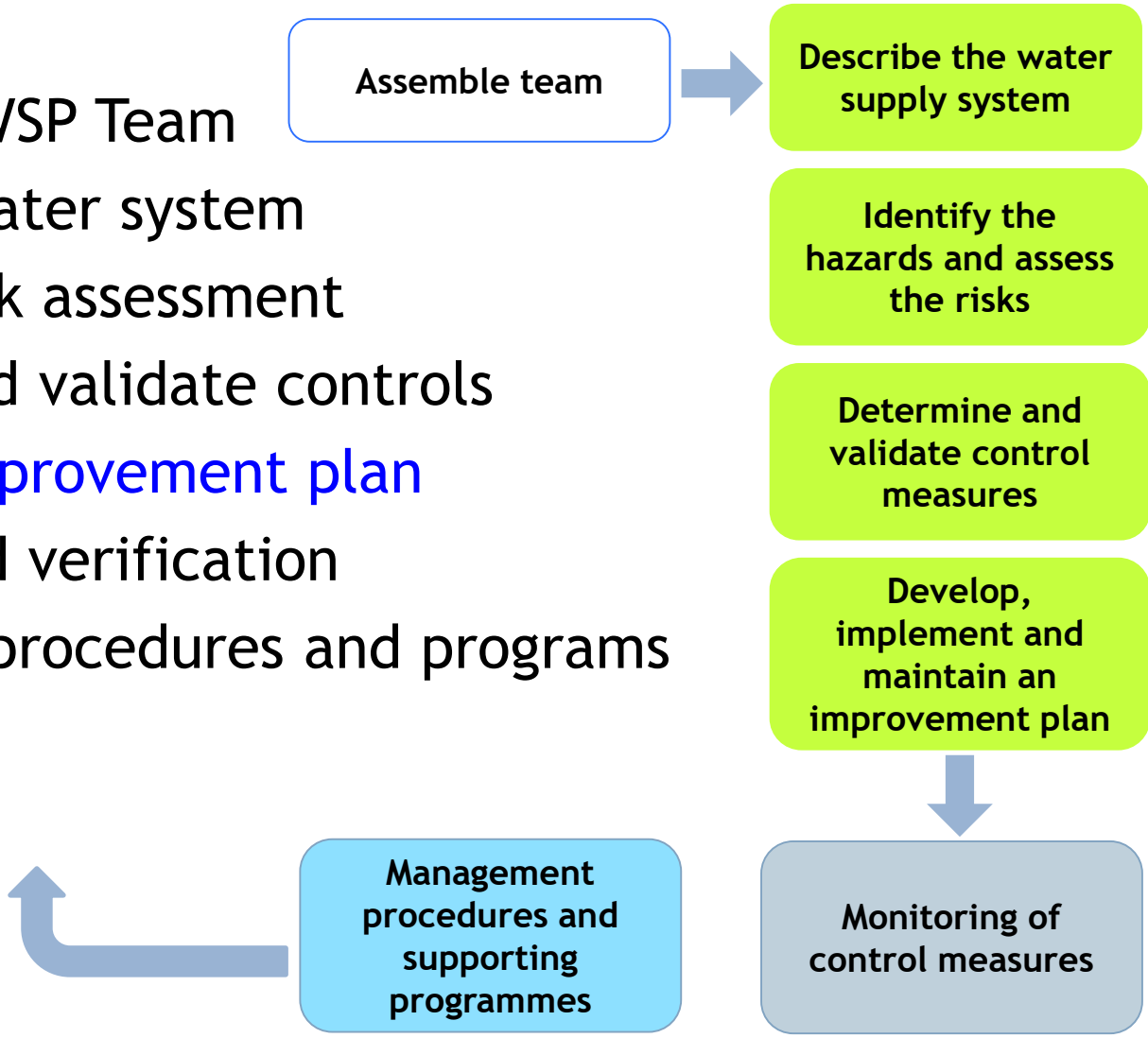


Develop improvement plan

Why do we need an improvement/upgrade plan?

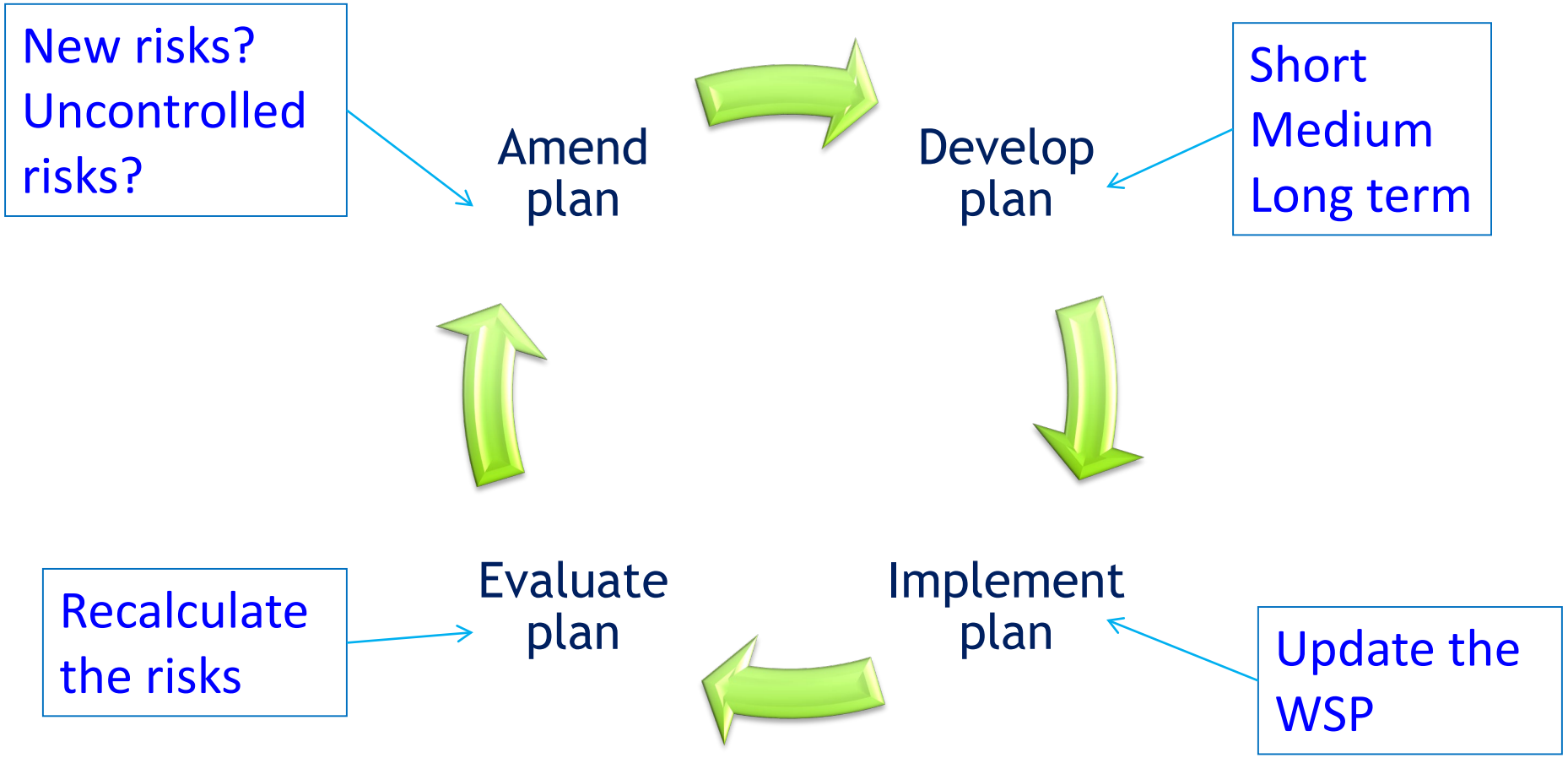
- If previous steps have revealed that existing controls are not effective
- Previous steps have revealed controls are not in place
- Prioritize action for each uncontrolled or ineffectively controlled risk
- Maximize effectiveness of resources
- Assigns responsibility for better accountability and tracking

Develop improvement plan

Overview

- **Improvement/upgrade plan involves**
  - Development
  - Implementation
  - Maintenance
  - Monitoring and review of upgrades
- **Required due to absent or ineffective control measures**
- **Should explicitly state who is responsible**

Develop improvement plan



Develop improvement plan

Outputs

- **A prioritized improvement/upgrade plan for addressing each uncontrolled risk**
- **Implementation of short-, medium- and long-term activities for upgrade**
- **A process for monitoring the plan**

Develop improvement plan

Exercise 6. Develop an improvement plan as part of the Water Safety Plan.

In groups…

Present Outcomes

Your organization does not have any of the controls you assigned as part of your WSP team's risk assessment.

Develop an improvement plan for your organization:

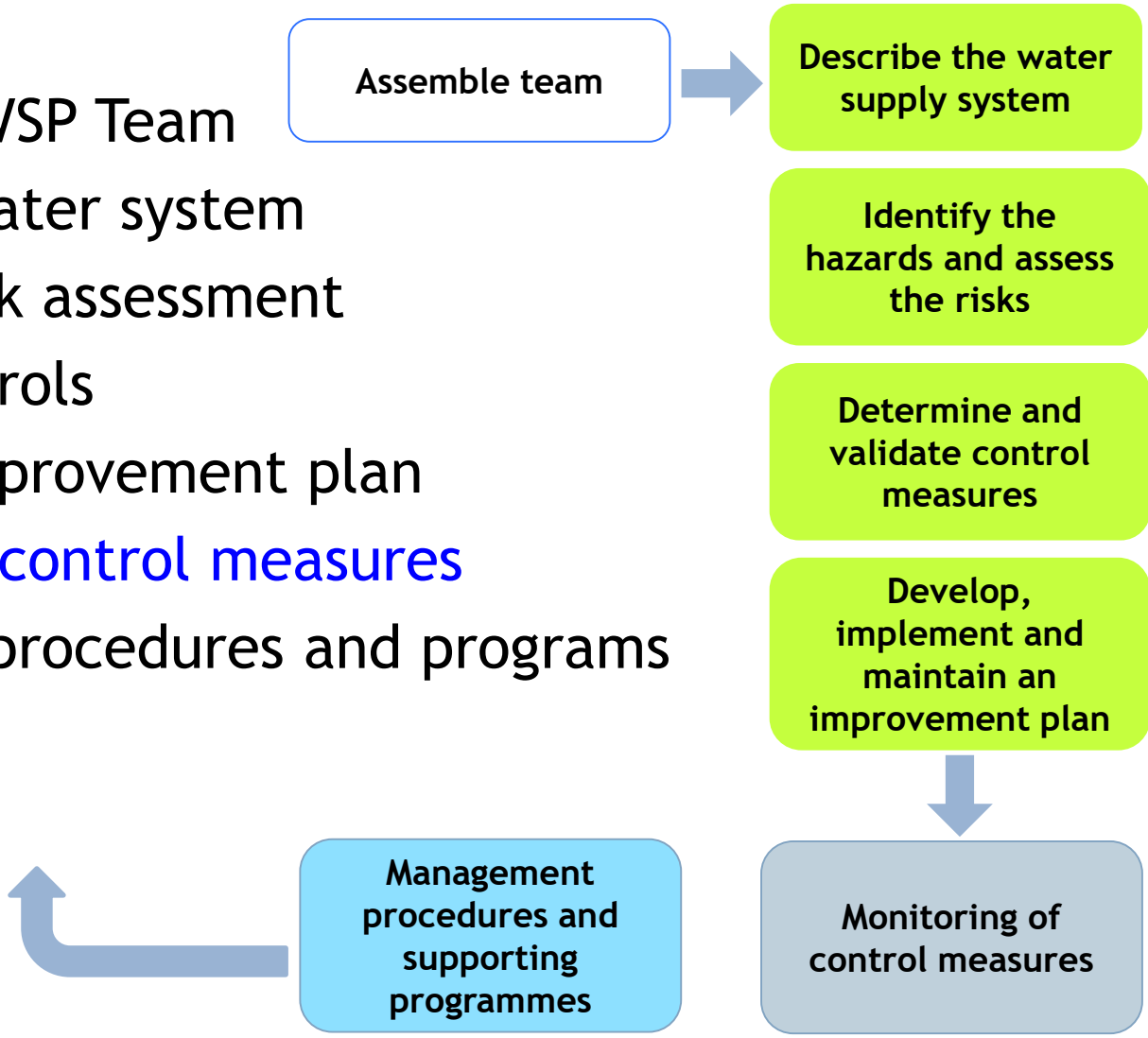
1. Identify the different activities required to apply each control measure.
2. For each action, include the Who, Where and When of the activity.

Choose one control measure's action plan to share with the class. Add to flipchart.

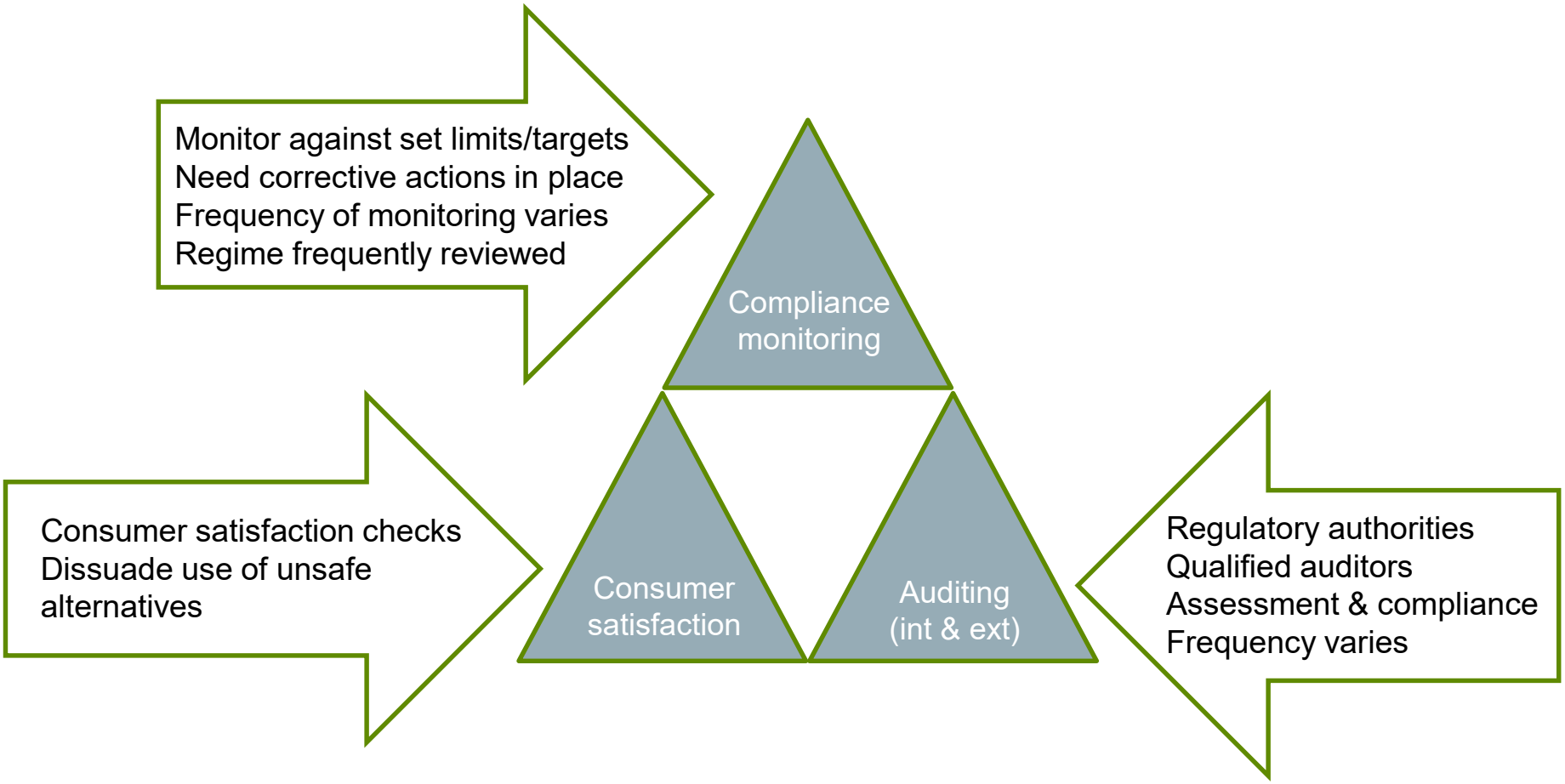
Water Safety Plan Process

WSP Tasks

1. ✓ Assemble WSP Team
2. ✓ Describe water system
3. ✓ Perform risk assessment
4. ✓ Assign controls
5. ✓ Develop improvement plan
6. Monitoring control measures
7. Document procedures and programs
8. Review

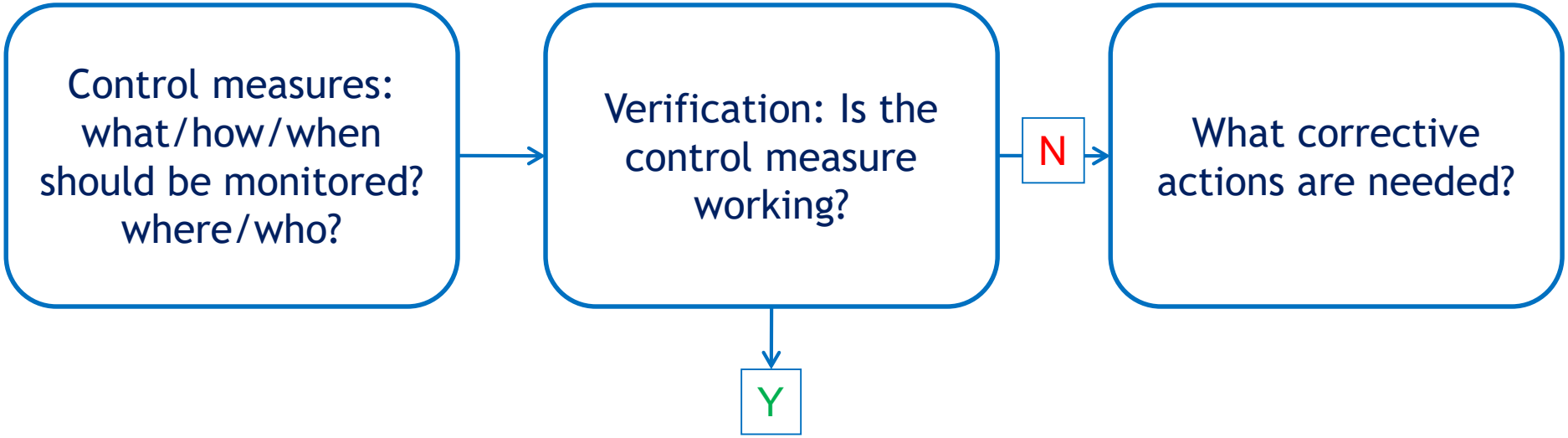


Monitoring control measures



Monitoring control measures

Monitoring Control Measures

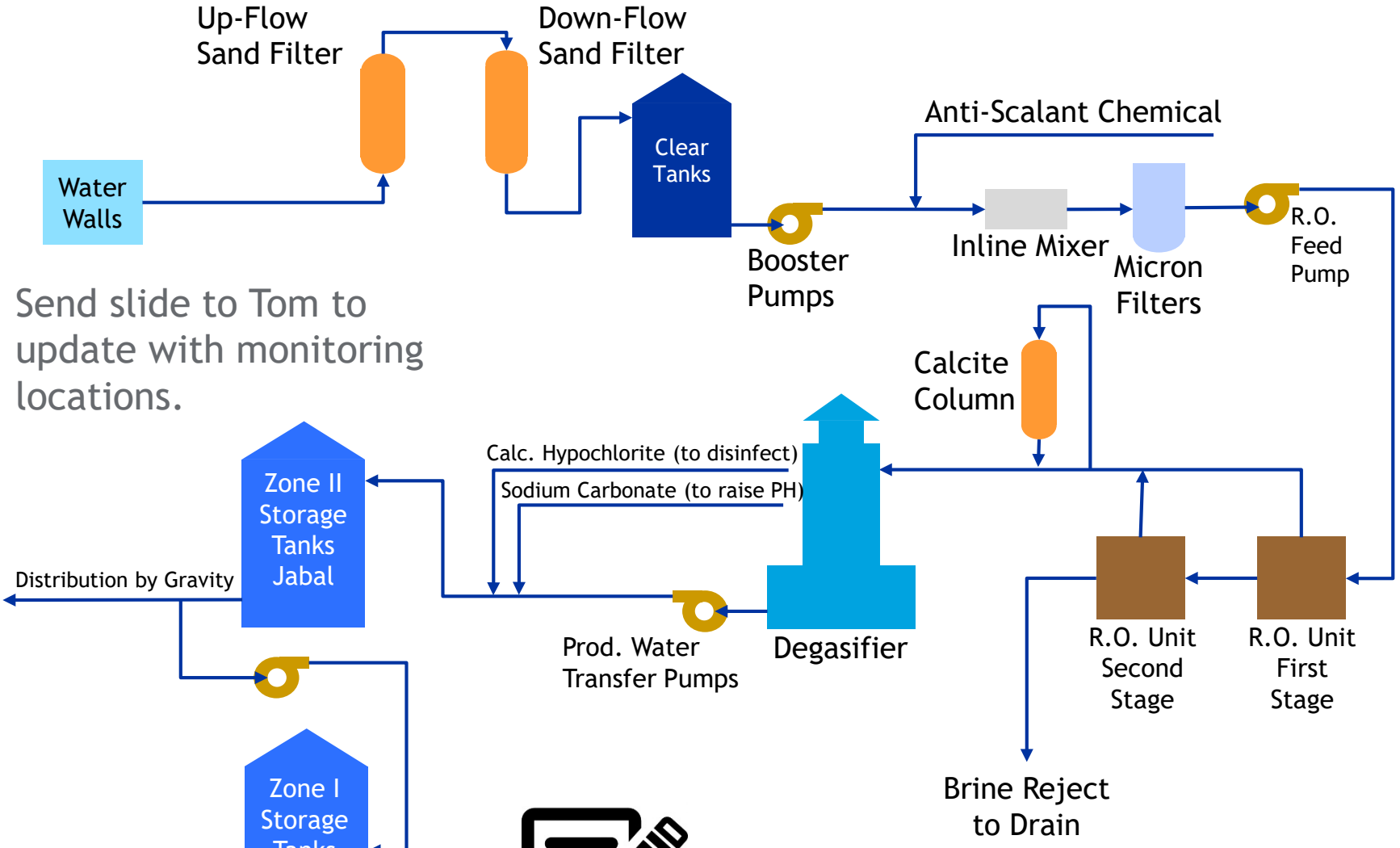


Monitoring control measures

Actions

- **Effective monitoring:**
  - What is being monitored
  - How
  - What time / frequency
  - Where
  - Who will monitor
  - Who will analyse
  - Who gets results

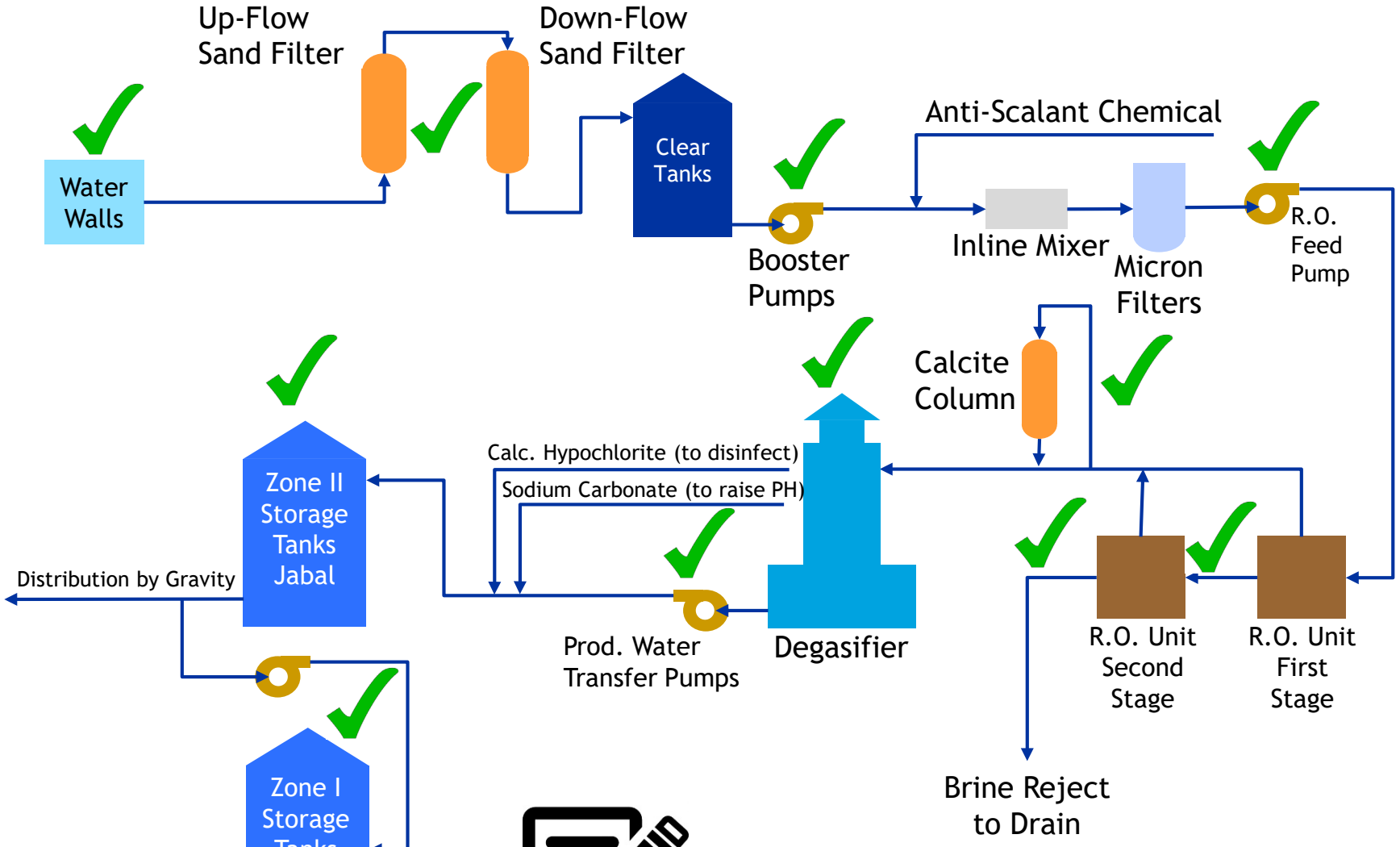
Monitoring control measures



Send slide to Tom to update with monitoring locations.

Identify monitoring locations.

Monitoring control measures



Identify monitoring locations.

Monitoring control measures

Unit process	Operational monitoring (see Module 6)			Verification monitoring		
	What	When	Who	What	When	Who
Treatment works	On-line measurement – pH – Chlorine	Daily	Water treatment operators / Analyst	*E. coli*	Weekly	Analyst
				Enterococci	Weekly	
				Record audit	Monthly	
	Jar testing records	Weekly				
	Turbidity	Daily				
	Dosing records	Monthly				
Distribution system	pH	Weekly		*E. coli*	Monthly	
	Turbidity	Weekly				
	Chlorine	Weekly		Turbidity	Monthly	
	Sanitary inspection	Weekly		Enterococci	Monthly	
Etc.						

Example Operational and Verification Monitoring Plans

Monitoring control measures

Challenges

- **Absent or ineffective evaluation of data**
- **Staff expectations / attitude**
- **Lack of resources for monitoring and corrective actions – human and financial**

/

Monitoring control measures

Exercise 7. Develop a list of operational monitoring tasks for water systems.

In groups…

- Identify the water system parameter to be monitored.
- Describe the accompanying operational monitoring task(s).
- Determine the frequency of the task.

5 min to do and share

Water Safety Plan

WSP Tasks

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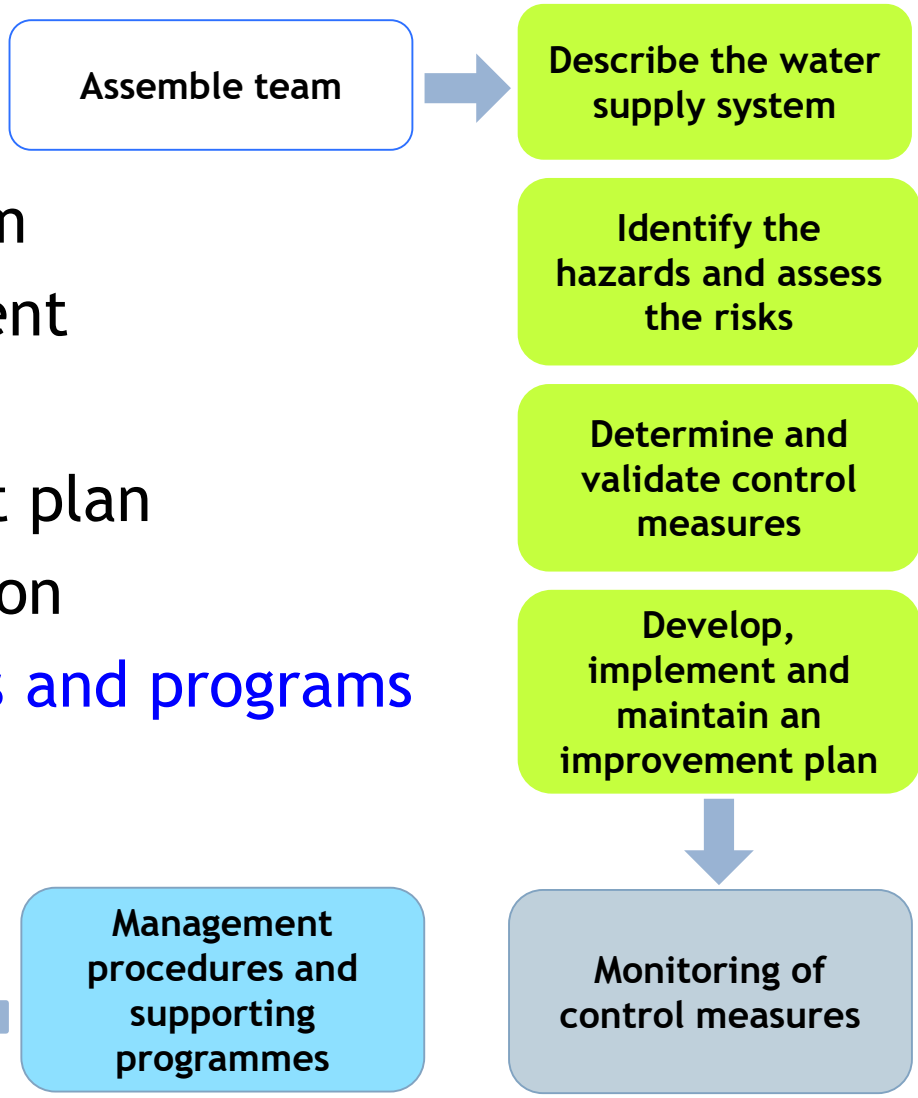


Document procedures and programs

Definition

Management procedures define the actions to be taken during normal operational conditions and emergency operational conditions and should detail the steps to follow in specific "incident" situations (corrective actions) when critical limits are exceeded.

Document procedures and programs

Normal operation

Standard operating procedures

Incident conditions

Corrective actions

Emergency situation

Emergency operating procedures

Document procedures and programs

Overview

- Written by experienced staff
- Updated as necessary
- Reflects improvement/upgrade plan
- Captures staff activities & responsibilities with regard to WSP

Document procedures and programs

Actions

- Identify and update the procedures, including develop corrective actions for when an “incident” occurs
- Generate generic emergency plan
- Promote WSP work culture – staff motivation
- Enable investigation of near-misses/incidents/emergencies
- Record near-misses/incidents/emergencies

Document procedures and programs

Challenges

- **Keeping up to date**
- **Ensuring staff are aware of changes**
- **Obtaining information on near-misses**

"It wasn't me...."

Document procedures and programs

Outputs (1)

- Defined responsibilities
- Defined protocols
- Operational monitoring

Standard operating procedures

Document procedures and programs

Outputs (2)

Corrective actions (as part of SOPs)

- Defined responsibilities
- Defined response actions
- Location of backup equipment

Document procedures and programs

Outputs (3)

- Defined responsibilities
- Defined response actions
- Emergency water supply

Emergency management procedures

Document procedures and programs

Outputs (4)

Communication protocols

- Consumers
- Within supplier
- Environmental agencies
- Regulators
- Health authorities
- Out of hours

Document procedures and programs

Outputs (5)

Documentation

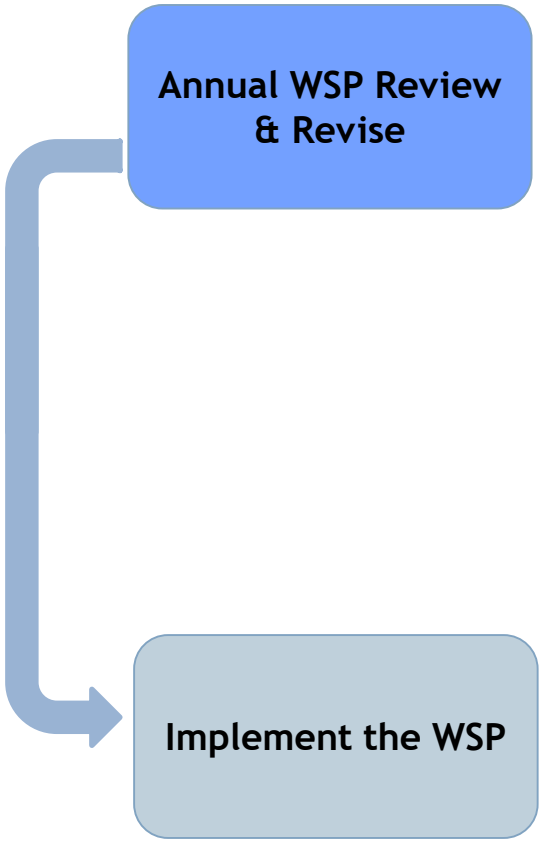
- Revise following incident
- Review regularly

Document procedures and programs

Document Control and Knowledge Management

- Operations
  - Produce a consistent product and know what to do when things go wrong
- Internal Auditing
  - Organizations must carry out annual internal audits
  - Records must be kept
  - Findings must be used in review of WSP

Water Safety Plan Process



WSP Tasks

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Overview – team can learn from....

Review

Actions

- **When to review?**
  - Regularly and planned
  - After any change (e.g. treatment upgrade)
  - After any emergency, incident or near-miss

Actions

- **What to review?**

- Changes in the catchment
- Revised procedures
- Staff changes
- Stakeholder contact changes

Review

Challenges

- Reconvening the WSP team
- Retaining institutional knowledge
- Maintaining enthusiasm
- Ensuring continual support for WSP
- Keeping records (of changes, data, etc.)
- Keeping in touch with stakeholders

Review

The benefits

- **Health**
- **Fewer incidents**
- **Appropriate responses to failures**
- **Etc.**

Output

An up-to-date WSP that is appropriate in given context

Water Safety Plan