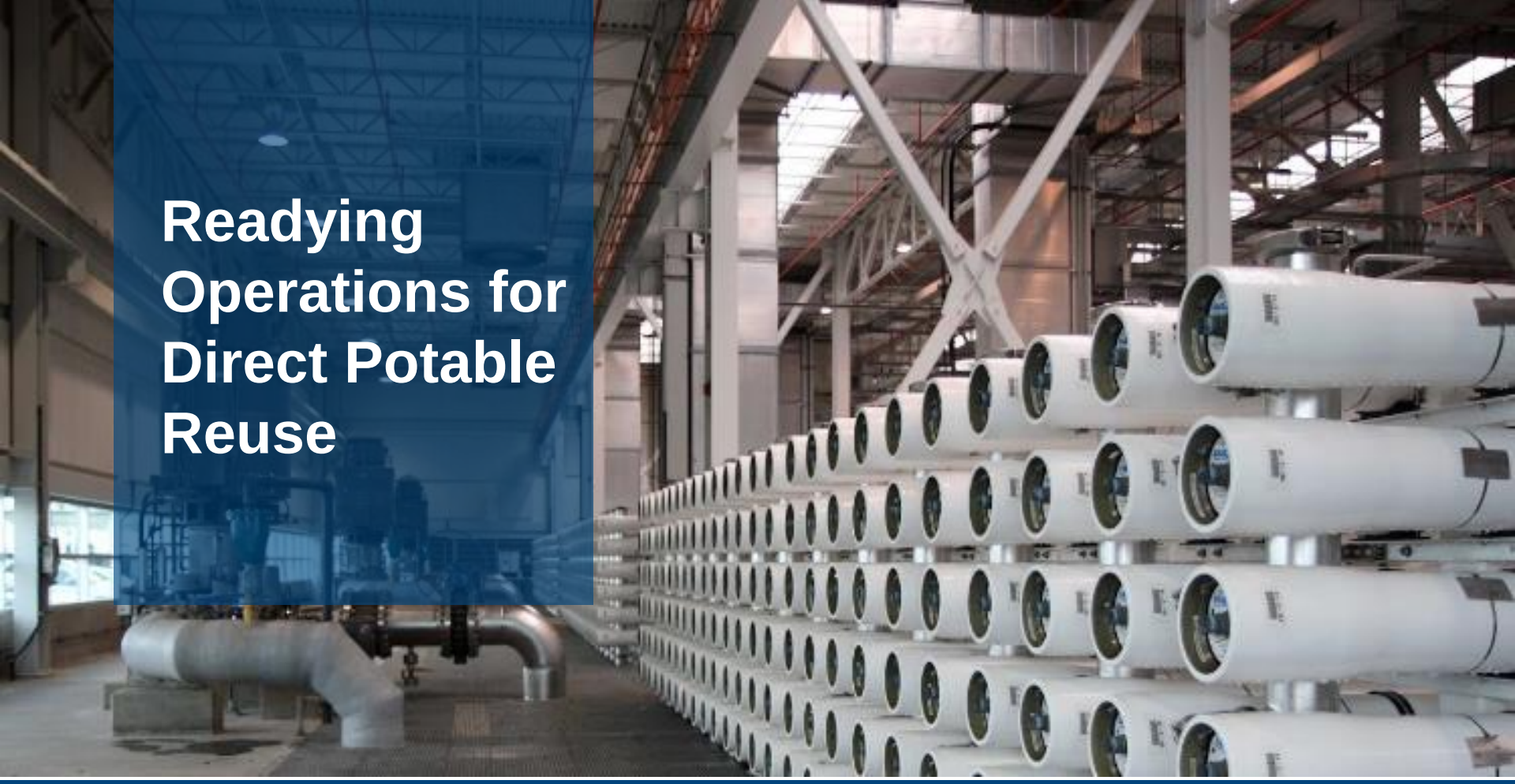


Readying Operations for Direct Potable Reuse

WRRF 13-13 Development of Operations and Maintenance Plan and Training and Certification Framework for DPR Systems

WATEREUSE RESEARCH

HAZEN AND SAWYER
Environmental Engineers & Scientists

Our Team

Troy Walker
Hazen and Sawyer
PI

John Caughlin
Operator Star

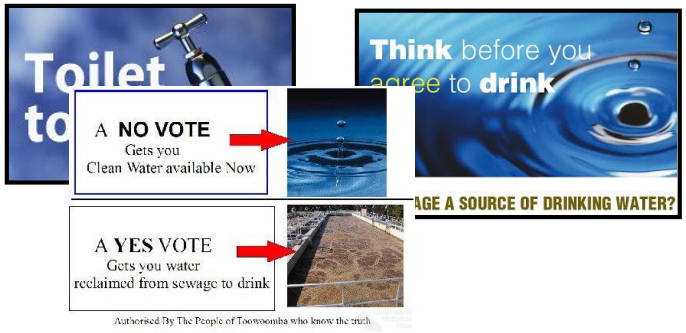
Debbie Burris
DDB Engineering
Co PI

Jim Vickers
Separation Processes Inc

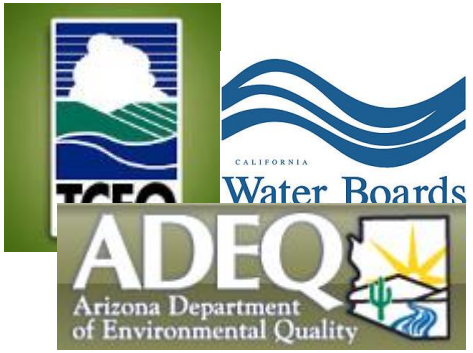
Ben Stanford PhD
Hazen and Sawyer
Co PI

Utility and Other Partners

Is Operations Ready for DPR?



Convincing a skeptical public



Convincing regulators

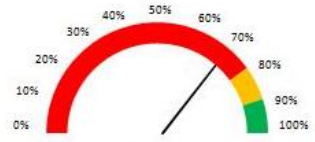
Can We Trust Operations?

"Eighty per cent of the failures he recorded were not due to failures of technology … but were due to human error"

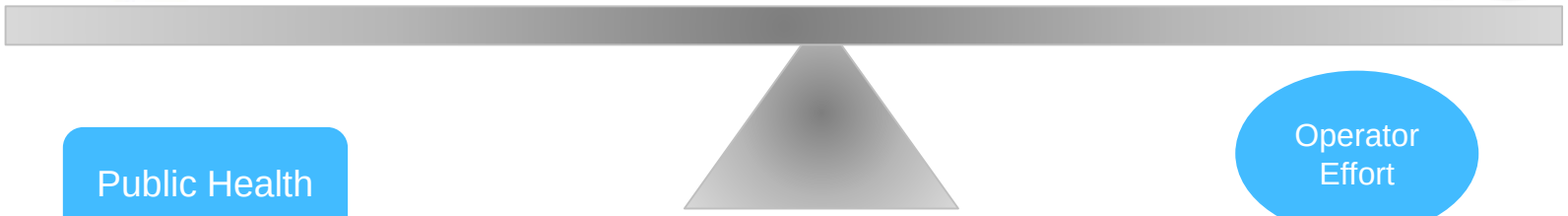
Professor Don Bursill, the CEO of the Cooperative Research Centre for Water Quality and Treatment, Australia 2007 (The Age June 5, 2007).

Operations - Striking the Right Balance

OPERATING RISK



OPERATING COST



Public Health

Quality

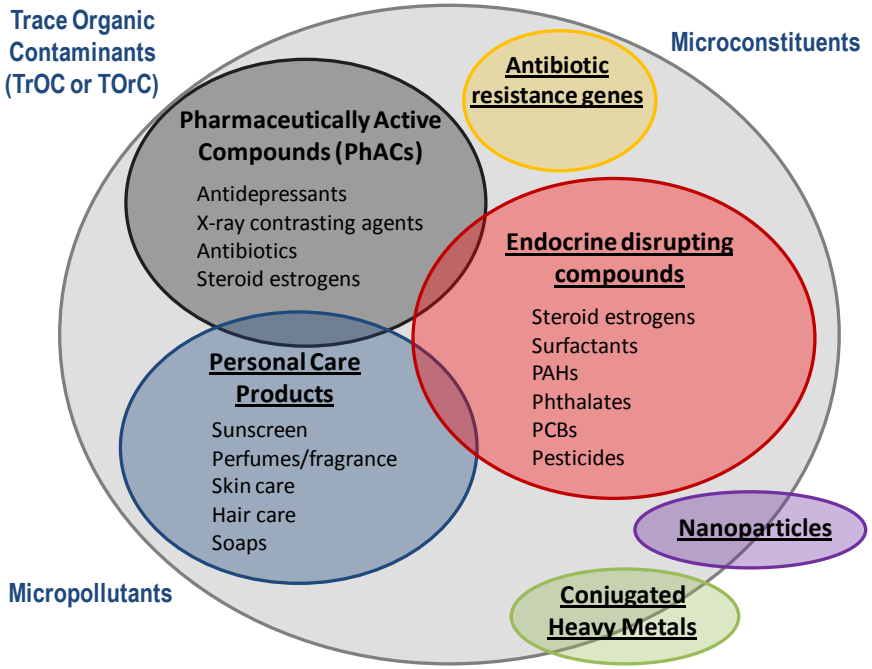
Production

Operator Effort

Chemicals and Energy

Asset Replacement

Public Health Protection is Paramount



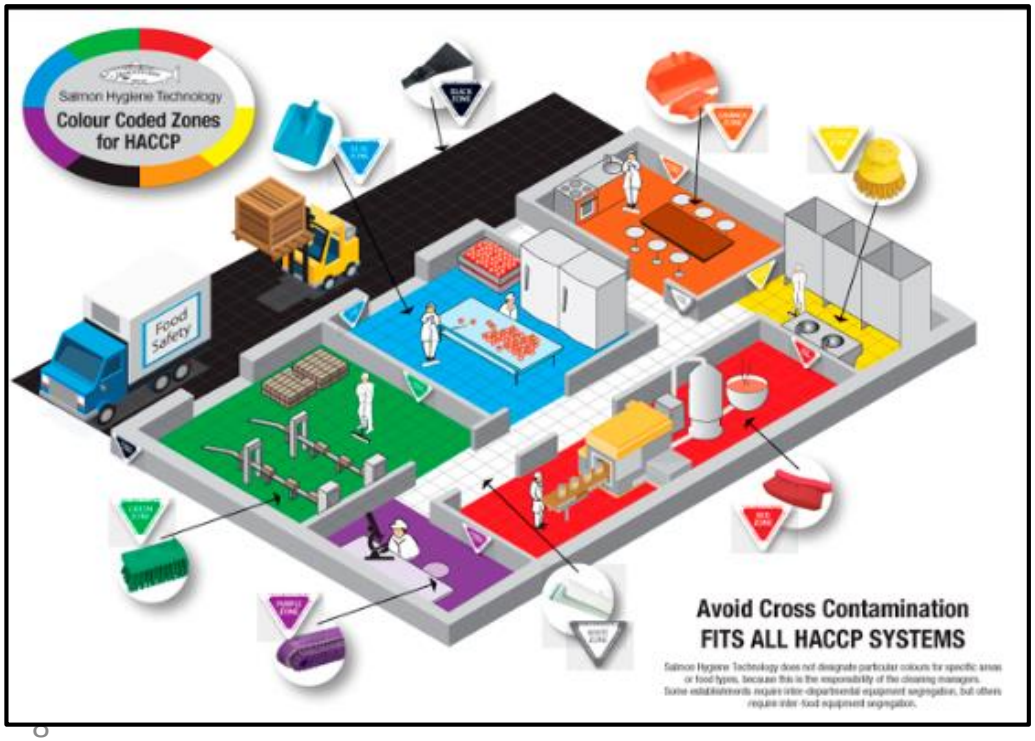
Critical Control Points

Integrating Public Health to Operations

Borrowing from the Food Industry – Critical Control Points

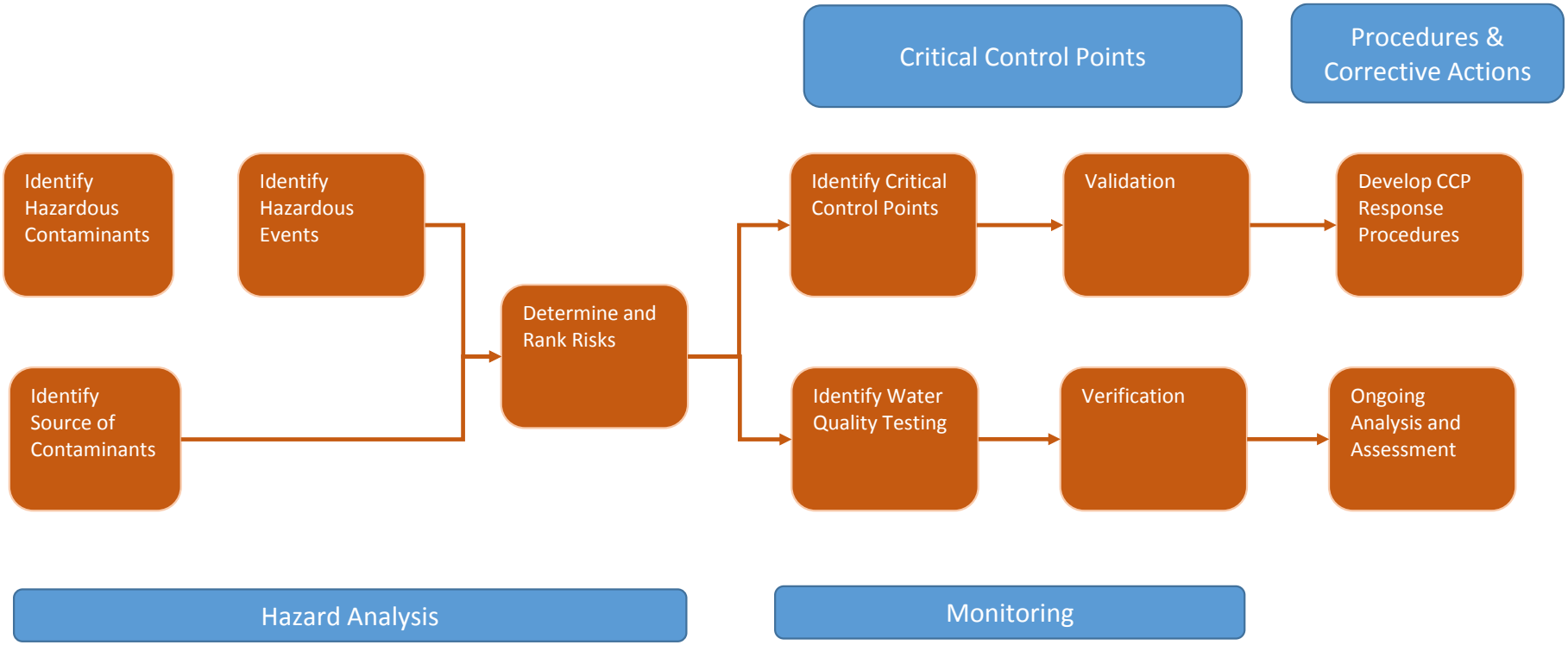
- Systematic Approach.
- Integrate elements to O&M for IPR/DPR

Conceived in 1960s by Pillsbury for NASA



Defined in ISO 22000 – Food Safety

CCP Approach Applied to Recycling



Operational Framework

DPR Operations Management Plan

Risk Management

- Risk Management Process
- Operational Risk Assessment
- Water Quality Risk Assessment

CCP

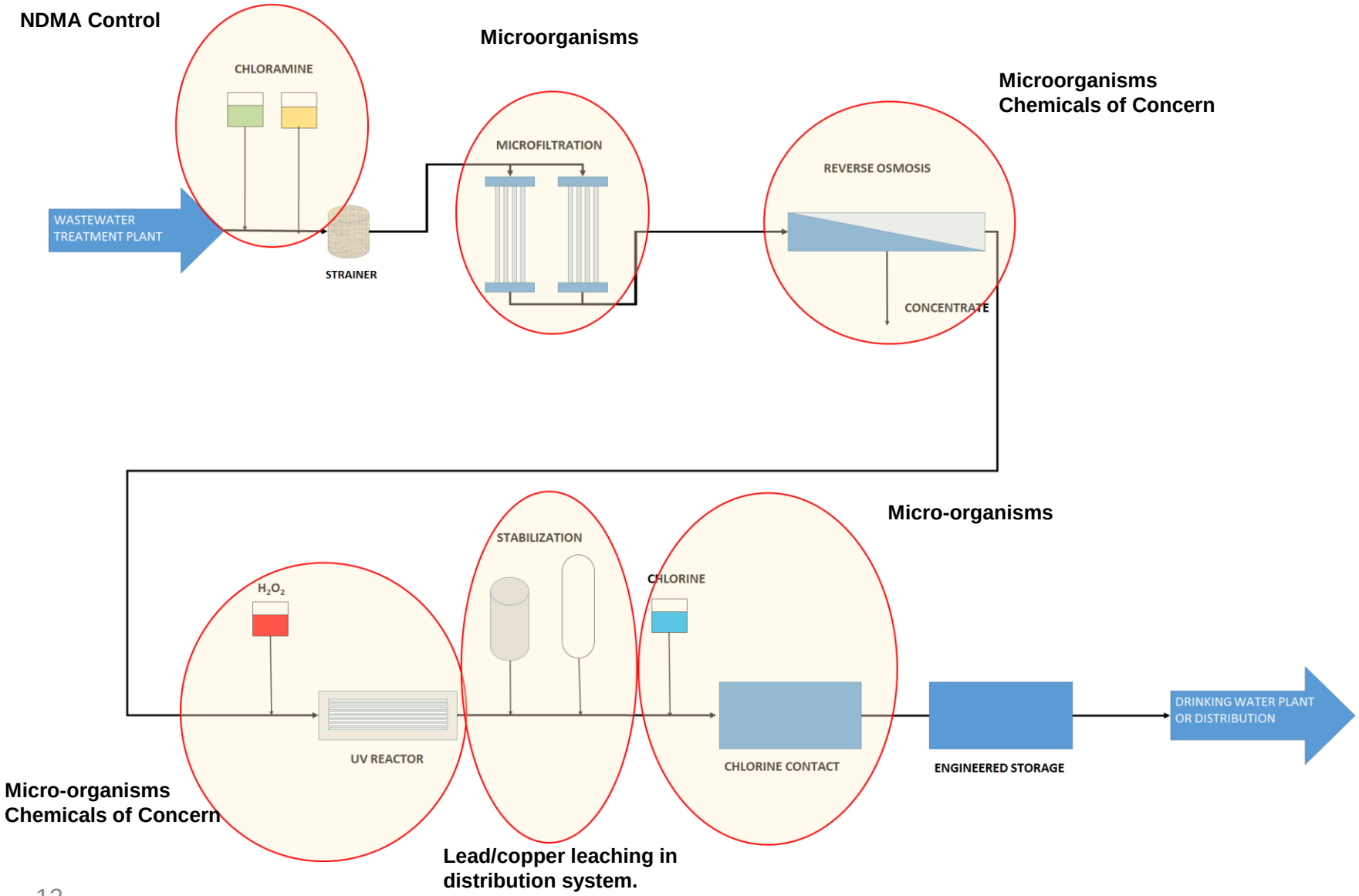
- Critical Control Point Selection
- Critical Control Point Management

Operations Management

- Roles and Responsibilities
- Operating Procedures
- Managing Incidents and Emergencies
- Asset Management and Maintenance
- Validation and Auditing
- Operational Monitoring
- Operator Skills and Training
- Non Conformances Corrective/Preventative Actions
- Operating Interfaces

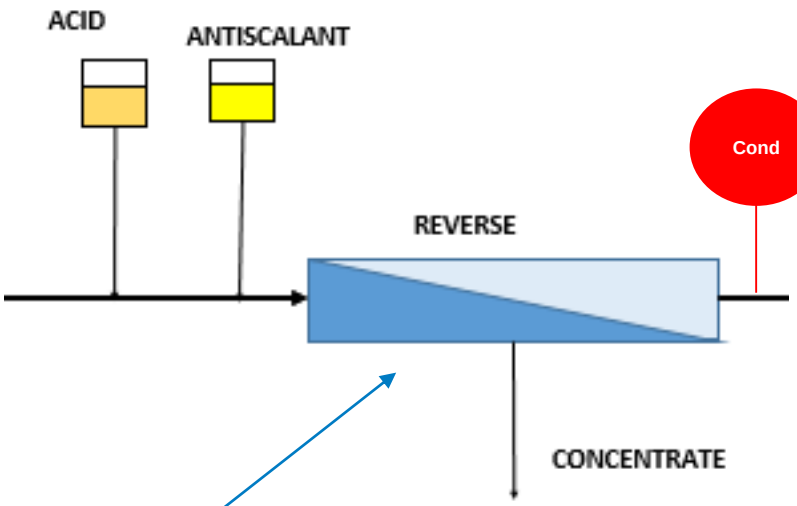
Critical Control Point Selection

CCP – Public Health Safety



Critical Control Point Management

How CCP works.

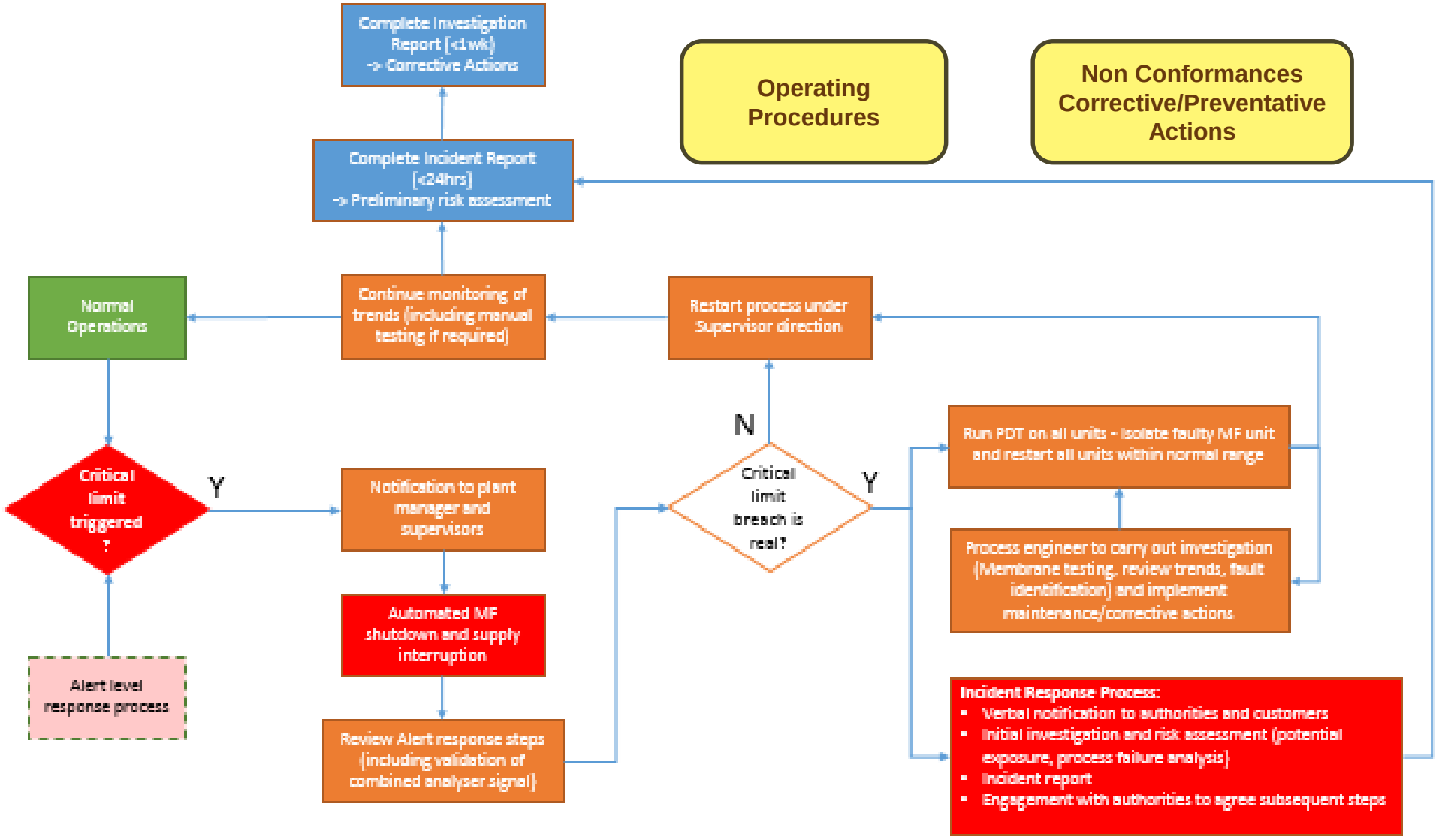


Monitor critical limit to validate barrier is intact

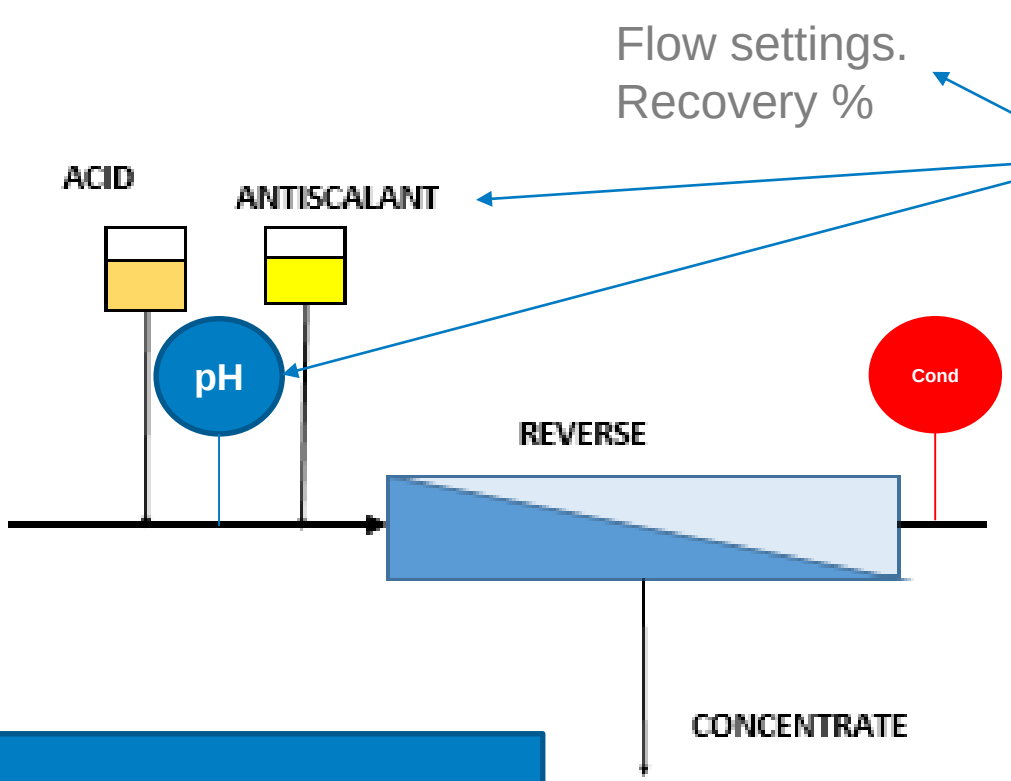
CCP is the process barrier

If monitor detects barrier not intact then **control action** and **standard operator response**.

Clear Response Procedure to Aid Ops



What About Other Important Process? Critical Operating Points



Supports CCP but not the critical monitor.

All supported by SOP

Operate as per CCP. Support plant, production and equipment.

We Rely Heavily on Analyzers

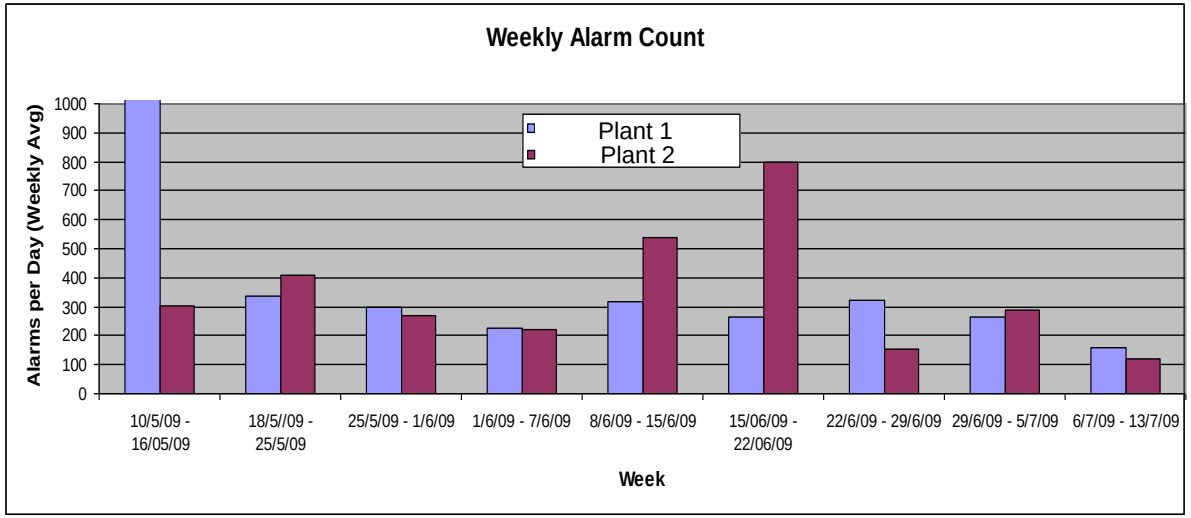
Operational Monitoring

- Calibration and verification of analyzers is critical.

High Automation – Need to Avoid Alarm Flooding

- Alarm systems must be manageable.
- CCP, COP alarms at high priority.

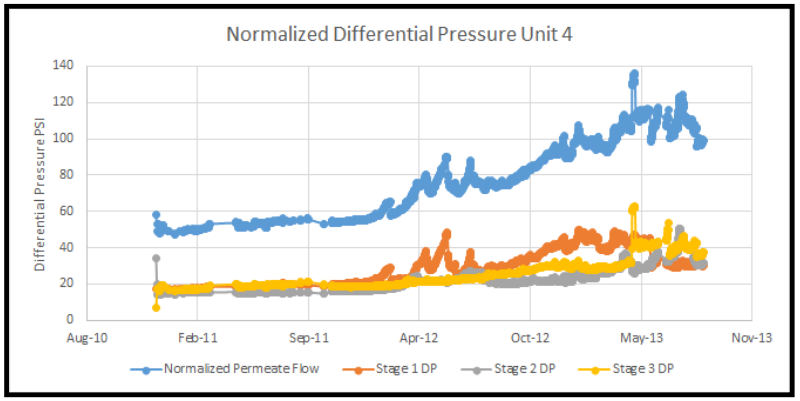
Operational Monitoring

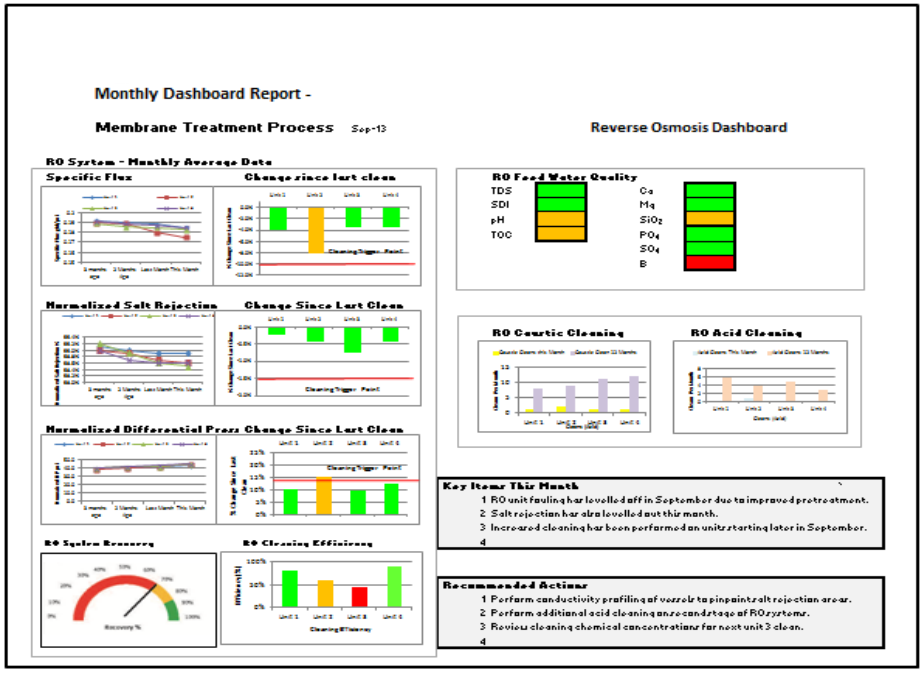


Anticipate Issues – Reports and Trends

- Effective performance trending.
- Dashboard reports provide good overview.

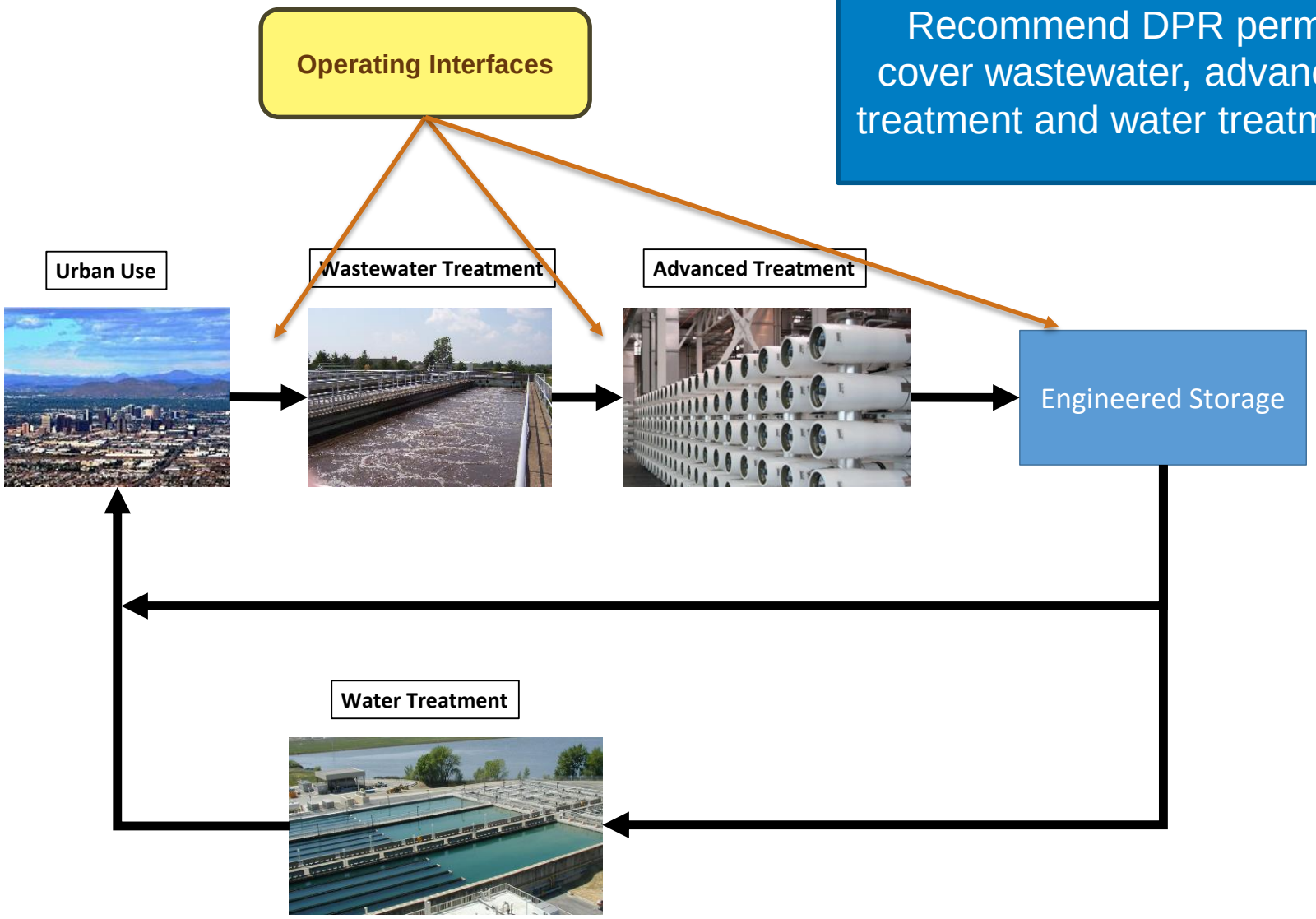
Operational Monitoring





Managing Across Jurisdictions

Recommend DPR permit cover wastewater, advanced treatment and water treatment.



Looking After The Equipment

Asset Management and Maintenance

- Things wear out.
- Equipment fails.
- Critical to success.

When to replace?

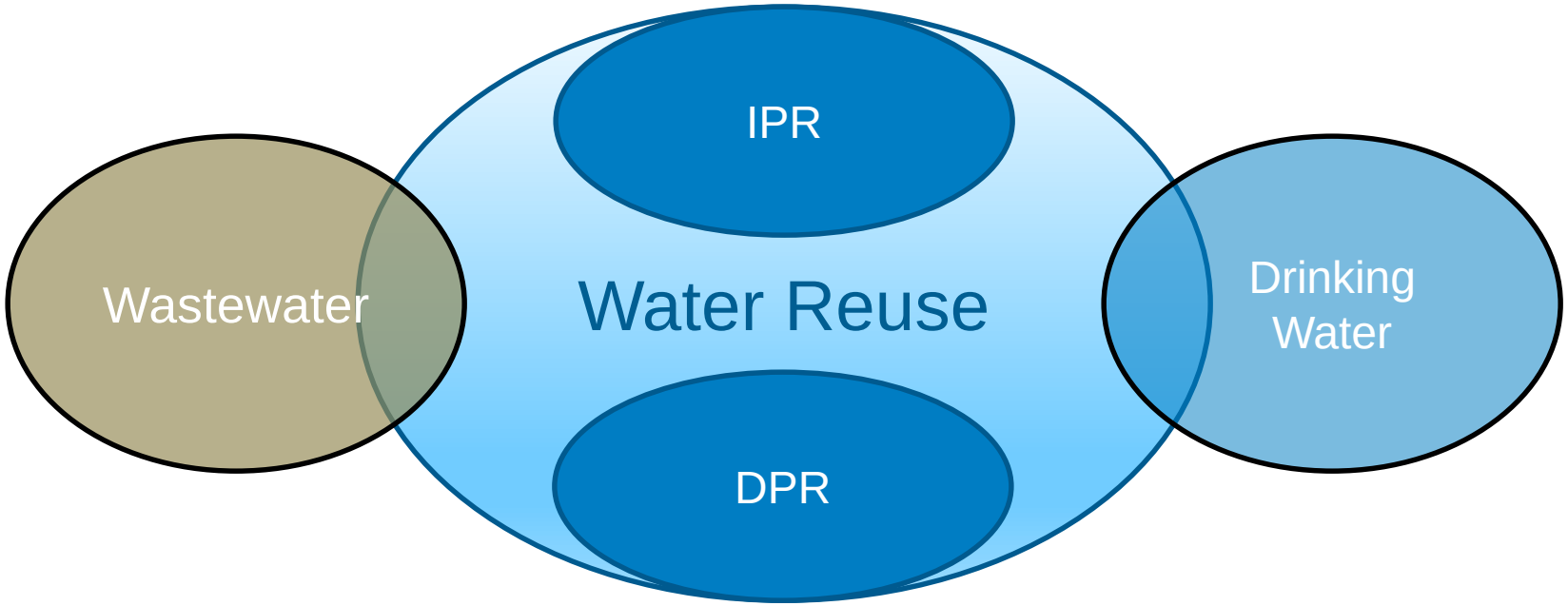
What spares to keep?

How often to maintain?

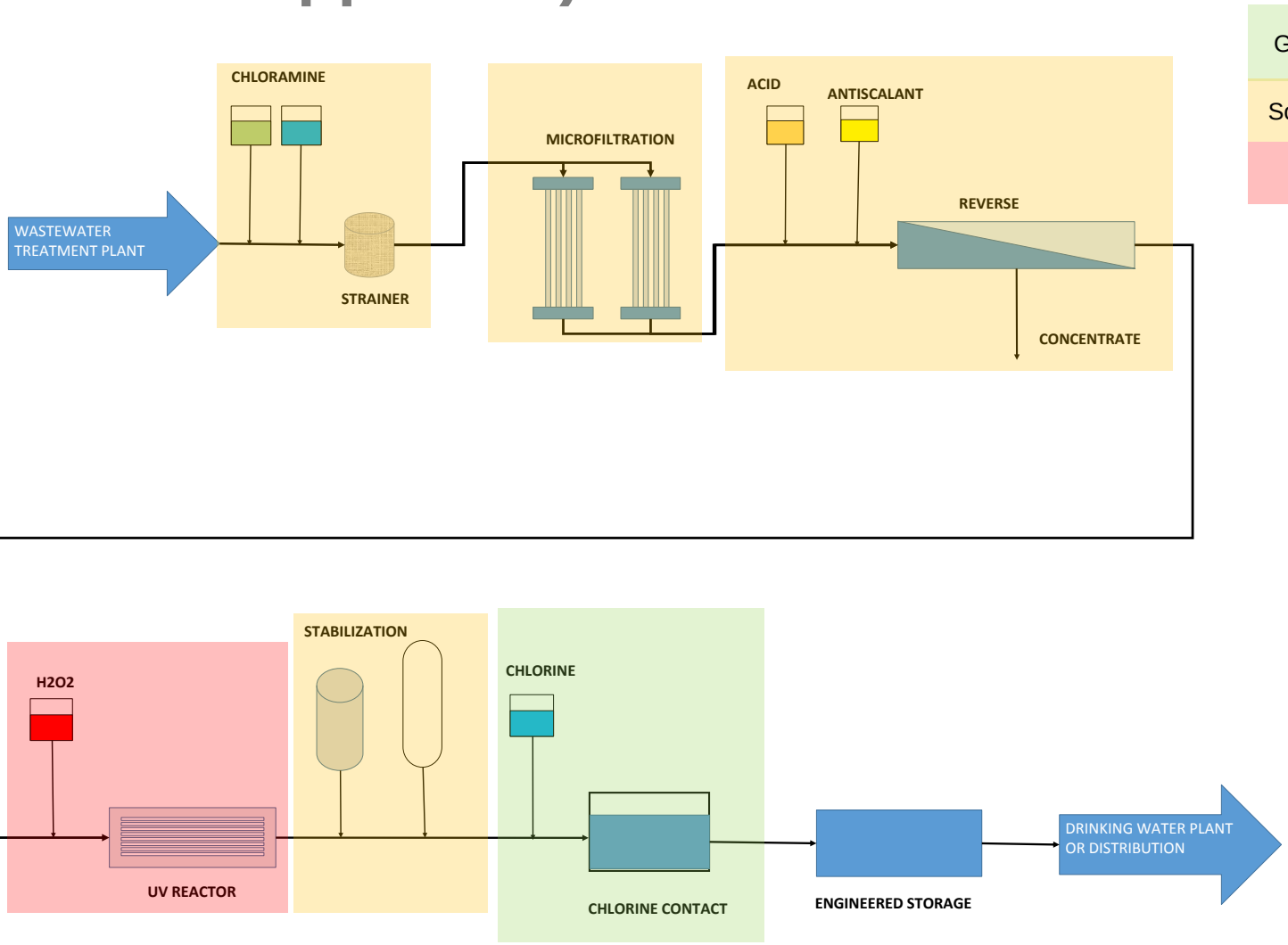
Certification and Training

Reuse Not Yet Well Covered

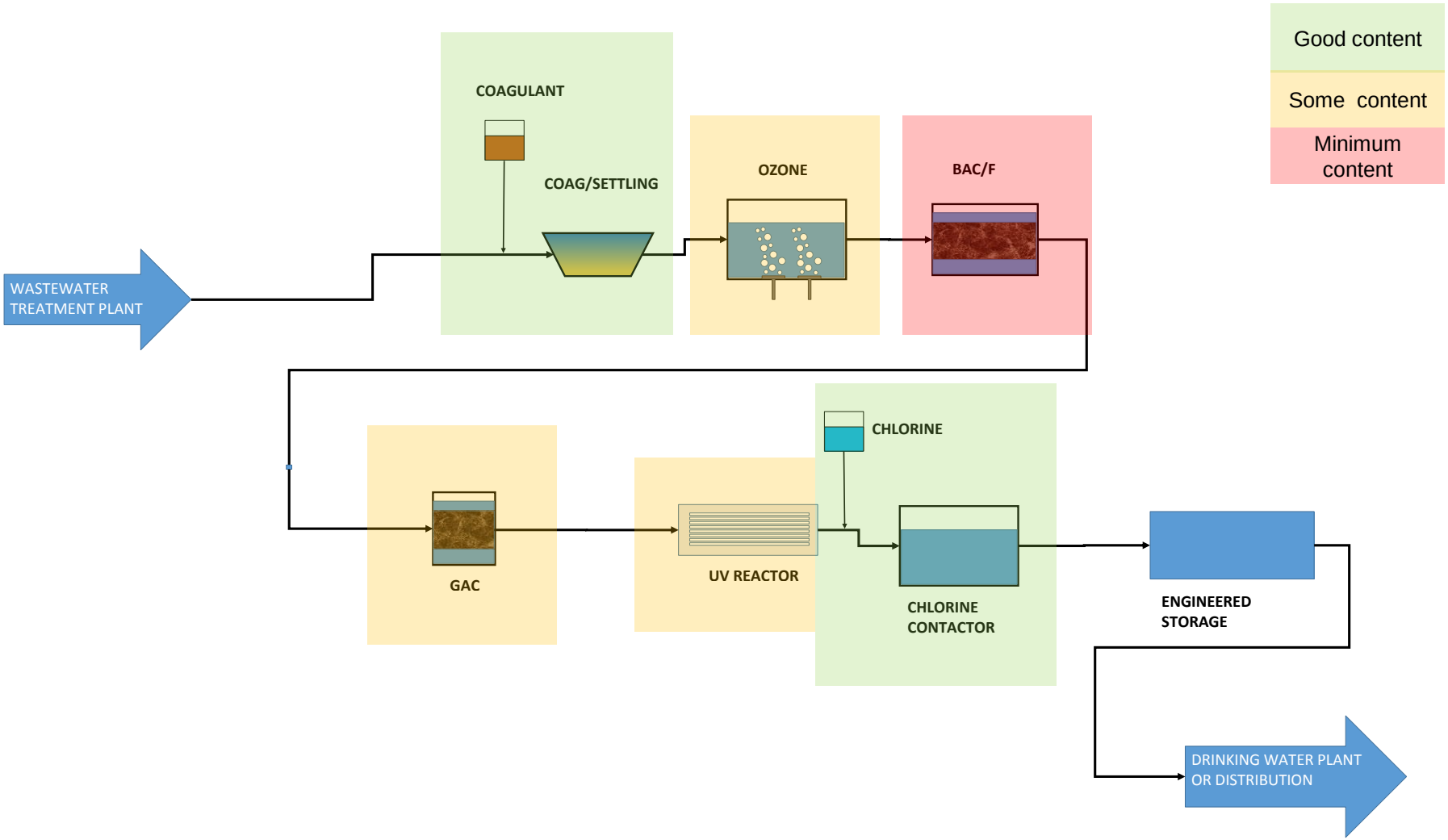
Operator Skills and Training



Existing Curriculum Content (Membrane Approach)



Existing Curriculum Content (Non- Membrane Approach)



The curriculum exists.

Specialist providers

AWWA/CWEA

Consultants

Membrane Associations

Equipment Vendors

In Addition to Process Knowledge

- Instrument Management (Calibration and Verification)
- Water Sampling and Analysis
- Basic Wastewater Knowledge
- Water Quality Health Risks
- Knowledge of DPR Regulations
- Basic Water Knowledge
- Managing a Risk Register
- Critical Control Points
- Corrective Actions

The Approach for IPR Now.

Orange County Water District

Always water certified.

Advanced treatment more in common with water treatment processes.

Santa Clara Valley Water District

Mostly Drinking water operators

Wastewater knowledge is still important.

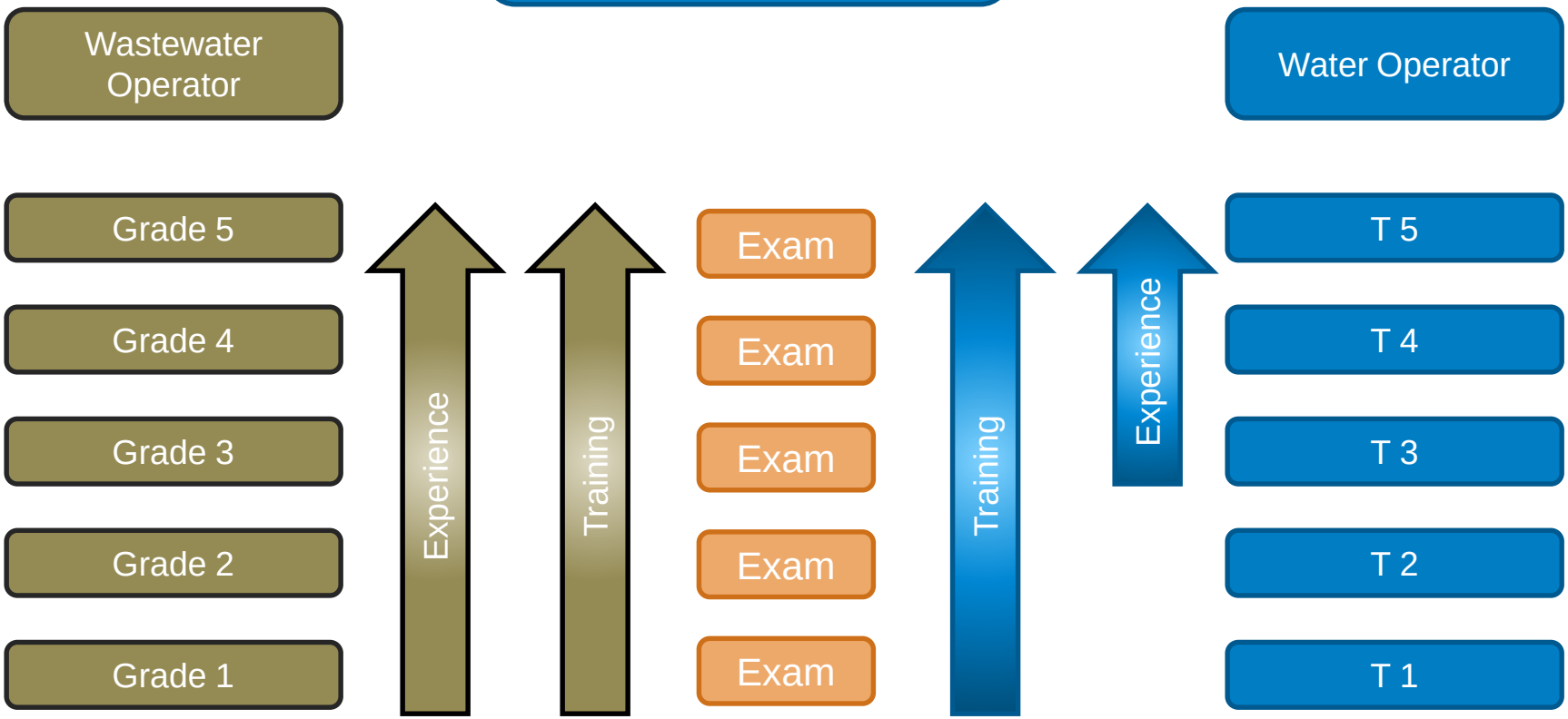
Heavy reliance on in house training.

Certification – The Current CA Approach

Title per 23 CCR, Division 3, Chapter 26

Also reviewing AZ, NC, Fl.

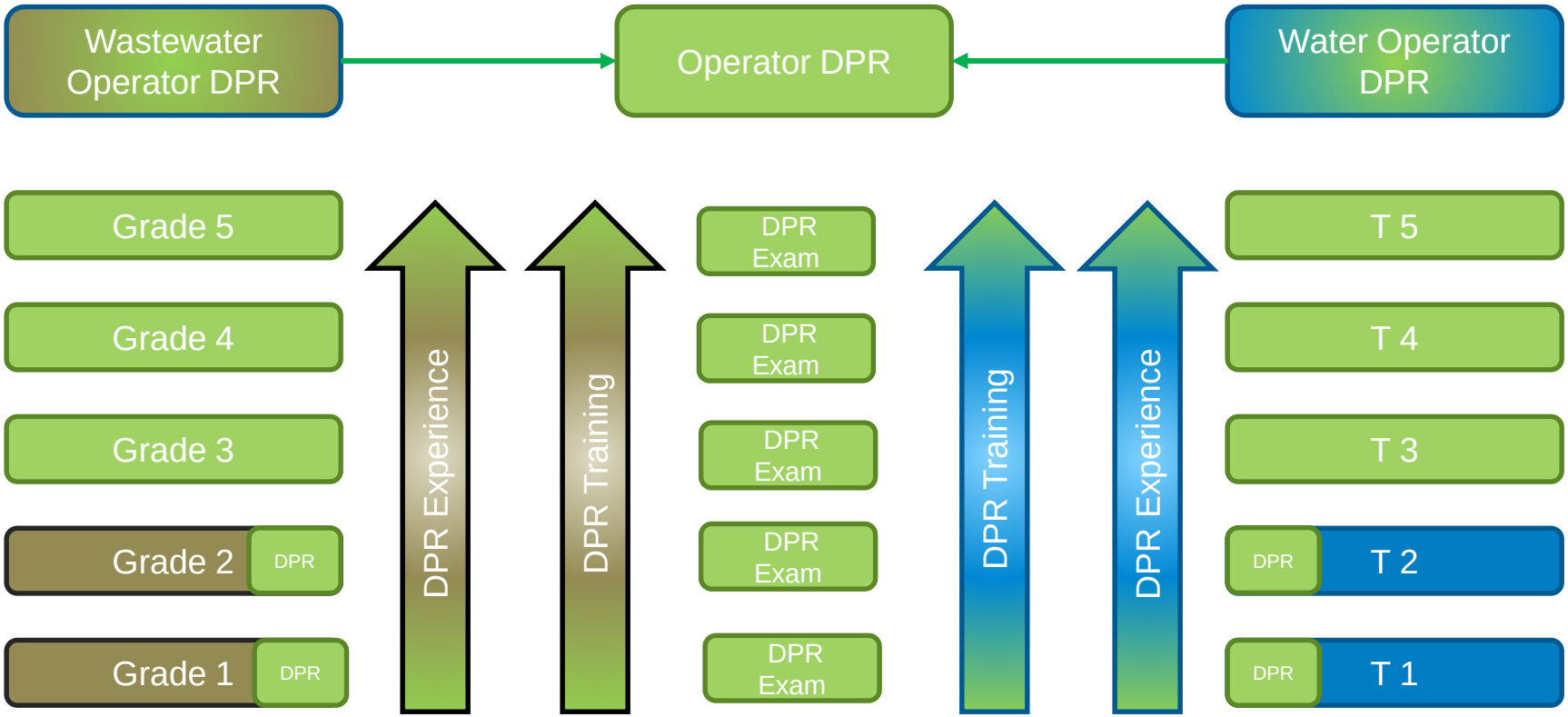
Title 22 CCR, Division 4, Chapter 13



A Potential Framework Integrating DPR

Leverage from existing pool of operators.

Append to system – options for operators.



The Right Staff?

Roles and Responsibilities

Partner Benchmarking

Zero based Assessment

(Actual Plant –Design phase)

Size and Complexity

Specific Roles

Build on the Existing Certification Levels

Classification of Water Treatment Plants is based on total points

Title 22 CCR, Division 4, Chapter 15 - Domestic Water Quality and Monitoring, Article 2

Area	Criteria	Points	Section
Source of Water	Groundwater and/or purchased treated water meeting primary and secondary drinking water standards, as defined in section 116275 of the Health and Safety Code	2	64413.1.b.1
	Water that includes any surface water or groundwater under the direct influence of surface water	5	
Microbiological water quality of influent	MPN less than 1 per 100 mL	0	64413.1.b.2
	MPN 1 through 100 per 100 mL	2	
	MPN greater than 100 through 1,000 per 100 mL	4	
	MPN greater than 1,000 through 10,000 per 100 mL	6	
	MPN greater than 10,000 per 100 mL	8	
Water Turbidity of Influent (for facilities treating surface water or groundwater under the direct influence of surface water)	Less than 15 NTU	0	64413.1.b.3
	15 through 100 NTU	2	
	Greater than 100 NTU	5	

(Extract)

Total Points	Class
Less than 20	T1
20 through 39	T2
40 through 59	T3
60 through 79	T4
80 or more	T5

Process complexity, number of processes and size. Similar approach for DPR.

Specific Roles

- Large plant – key person.
- Smaller plant – part of responsibilities.
- Mix of water and wastewater knowledge.

DPR Water Quality

- Source water quality
- Water quality risk register

Operating Interface

- Wastewater to Advanced
- Advanced to Drinking/Distribution

Instrument Calibration/Verification

- Calibration/Verification Schedules.
- Alarm Management

CCP Manager

- Manage data on CCPs
- Follow up on incident investigations.

Conclusions

- A single permit – wastewater/advanced/water
- Critical Control Point Approach should be integrated into operational planning.
- A solid operational plan will underpin success for DPR operations.
- Certification for DPR can leverage from existing systems.

Thank You

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