

Developing national strategies for protecting public health and the environment

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Water Supply Strategy Lead

EPA National Water Event 2015
17th June 2015



Developing national strategies for protecting public health and the environment

... it's part of the vision

IRISH WATER'S VISION

Through responsible stewardship, efficient management and strong partnerships, Ireland has a world-class water infrastructure that ensures secure and sustainable water services, essential for our health, our communities the economy and the environment'

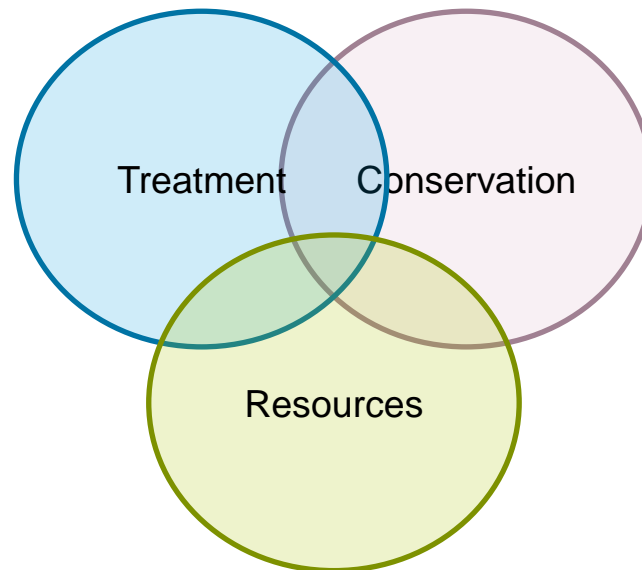
My Background

- **Energy:** ESB Cork City 10KV upgrade
- **Automotive:** Ricardo Consulting Engineers, systems integration and software development
- **Process Automation:** An Post Mails Integration (change programme) 80% manual -> 80% automated
- **Systems Integration:** Siemens/NEC Standards Development ISO 500001, CEN TC331
- **Technology & Innovation:** Altran Technologies: Lean auditing, innovation, technology and process improvement
- **Water Services:** Laois County Council: Capital projects (WSIP), water conservation and rural water programmes, plant upgrades, EPA & HSE liaison
- **Energy Management:** Midland Energy Agency
- **Strategy & Asset Management:** Irish Water

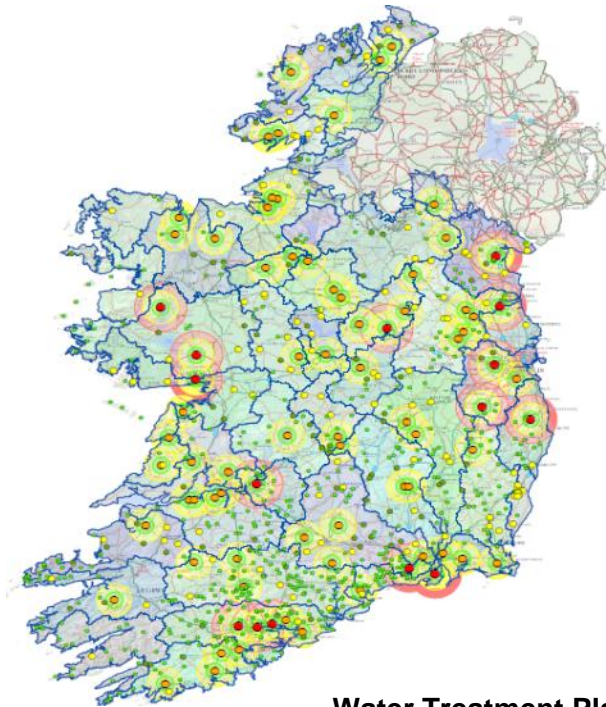


The Team Objective

- *“The Water Supply Strategy team, as **asset owner for water supply assets**, is responsible for **definition** of all **asset strategy** for water and for devising **long term water supply plans** ensuring the **optimal use of water resources**”*



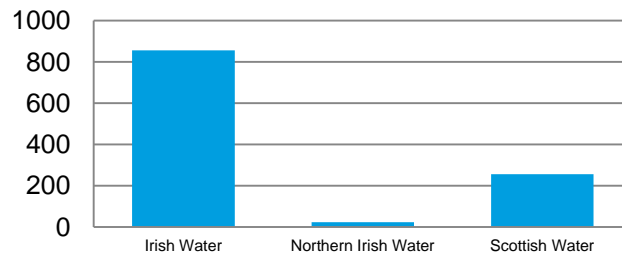
National Water Treatment Plant Assets



Current Asset Base

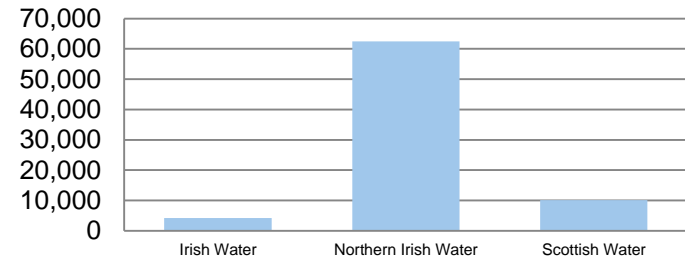
- 856 Water Treatment Plants
- 560 WTPs <1 MI/d
- 20% Plants Less than 5% Headroom in WAFU
- 361 WTP Simple Disinfection Only
- 60,000Km of water mains
- > 2,000 Pump Stations
- > 1,700 Reservoirs

Water Treatment Plants



■ Water Treatment Plants

Population /Treatment Plant



■ Population /Treatment Plant

Risk Based Approach: The Elements of the Drinking Water Safety Plan (DWSP)

DWSP Elements

1. Source (37)

2. Raw Water (18)

3. Treatment (74)

4. Distribution (28)

5. Customer (3)

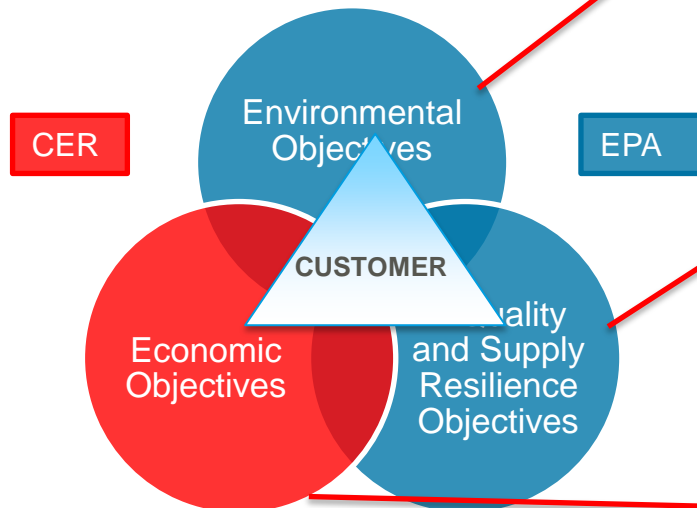
6. Management (4)

Source: <ul style="list-style-type: none">Variable quality, WWTP, Livestock, Pesticides		Asset Based Measures Treatment Strategy / Water Conservation Strategy (Short/Medium Term)	NWRDP / WFD / National Strategies (Medium/Long Term)
Raw Water : <ul style="list-style-type: none">Intake (algae, zebra mussels, livestock)			
Treatment: <ul style="list-style-type: none">Inappropriate process, inadequate process control / maintenance/ / intervention, loss of power / telemetry			
Distribution: <ul style="list-style-type: none">Contamination due to leaks / bursts / interruptions / low pressure / backflow / contaminated ground / lead			
Consumer: <ul style="list-style-type: none">lead / copper / fittings			Lead Plan
Management: <ul style="list-style-type: none">Training / housekeeping / Security (IT)			WIOF / LANTG / Telemetry

National Water Resources Plan

NWRP will define how Irish Water will balance the needs of customers and regulators in terms of a high quality resilient water supply, based on environmentally sound principles, in an effective and cost efficient way

- Limited alignment WFD objectives
- Unlicensed SW abstractions
- Pending licencing for GW abstractions
- Limited assessment of cumulative impact of abstractions on water body
- Limited assessment of GW/SW interactions
- Misalignment between areas of growth and water resource availability
- Limited assessment or planning for climate change impact on current resources



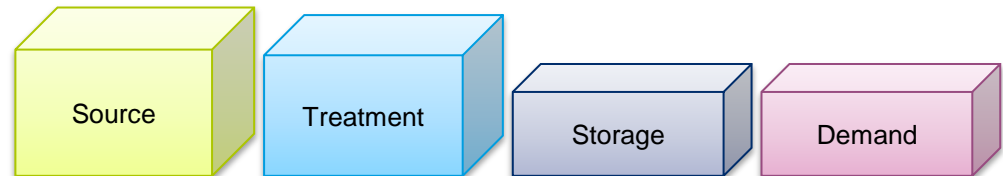
- Catchment Management
- Variable Raw Water Quality
- Inadequate Treatment at many WTPs
- Limited connectivity between supplies

- Economies of Scale
- CAPEX requirement to upgrade Small Plants plus
- Headroom and Peak Factor Costs
- OPEX and Management
- Catchment Management

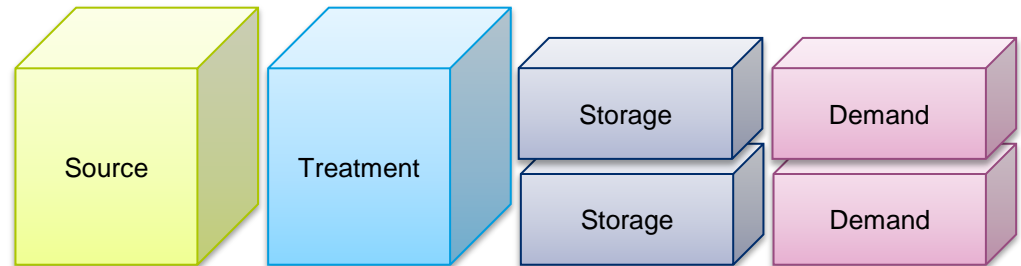
Max daily output (m3)
 10 - less than 1000000
 11 - 10000 - 2000000
 12 - 2000 - 5000000
 13 - 5000 to 2000000
 14 - greater than 2000000

Supply/Demand Issues and Options

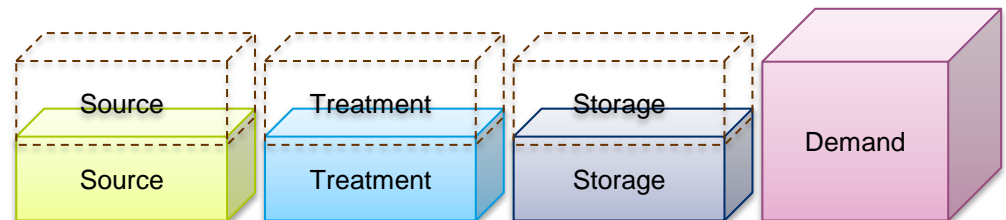
Excess Supply



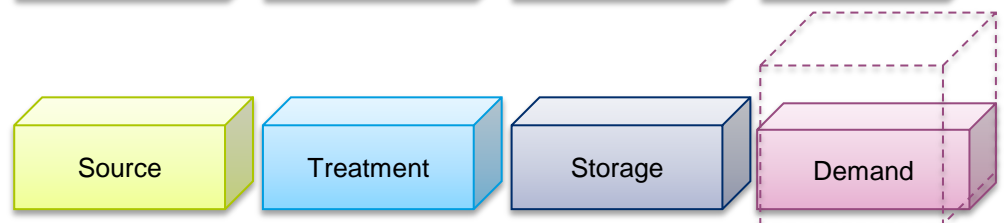
Opportunities to rationalise



Excess Demand: Need for source/treatment/storage



... or Demand Reduction



Treatment

Protozoal Compliance Requirements

Table D.1: Log credit requirements for different catchments and groundwater categories

	Groundwater	Surface water	Log credit requirement
Inactivation	G1 Low risk (no microbiological contamination) – sealed bored well with source protection, water drawn from deeper than 30m	Not applicable	0
	G2 High risk (with microbiological contamination) – sealed bored well with source protection, water drawn from deeper than 30m	Not applicable	2
	G3 High risk (with microbiological contamination) – sealed bored well with source protection, water drawn between 10m to 30m (Groundwater default)	S1 Upland catchment - no agricultural activity in immediate vicinity or upstream	3
	G4 High risk (with microbiological contamination) - spring or bored well, water drawn <10m, in upland catchment with low concentration of cattle, sheep, horses or humans in immediate vicinity or upstream	S2 Upland catchment - low concentration of cattle, sheep, horses or humans in immediate vicinity or upstream (Surface water default)	4
Removal + Inactivation	G5 High risk (with microbiological contamination) - spring or bored well, water drawn <10m, in lowland catchment with high concentration of cattle, sheep, horses or humans in immediate vicinity or upstream or waste treatment outfall upstream	S3 Lowland catchment – high concentration of cattle, sheep, horses or humans in immediate vicinity or upstream or waste treatment outfall upstream	5

Treatment Strategy: Design Specifications

- Builds on EPA Advice Notes / Manuals
- Guide appropriate process selection - Rules based
- HSQE / Energy Eff. / DWSP built in



- Reduced inventory
- Simplified training
- Simplified documentation
- Simplified maintenance
- Simplified workplans

Application and Delivery in Mind

- Design templates for consistent results
- Standardised configuration – validation built-in
- Productised solutions – faster, efficient rollout

Disinfection - Chlorination Validation Calculation

Plant Details

Scheme Name:	Example Scheme
Treatment Plant Name:	Example Water Treatment Plant
Water Supply Zone Code:	W52000
Maximum flow:	200.00 m ³ /hr
Calculation prepared by:	A.N. O'Brien
Date:	31/10/2014

Contact Tank Shapes

W L d

D

Target Ct

Source:	Surface Water (Lake)
Maximum pH:	8.20
Minimum Temperature:	5.00 °C
Maximum Filtered Water:	0.4
Turbidity:	NTU
Minimum Ct:	15
pH Factor:	1.3
Temperature Factor:	1.2
Turbidity Factor:	1
Target Ct	23.40 mg·min/l

Effective Ct - Contact Tanks

Contact Tank	No. 1	No. 2
Tank shape	Rectangular *	Circular **
Internal length (L) *	10.00 m	
Internal width (W) *	10.00 m	
Internal diameter (D) **		3.00 m
Minimum depth (d)	3.00 m	0.00 m
Tank volume	300.00 m ³	0.00 m ³
Flow distribution	Equal	Average
Distribution factor	0.5	0.5
Effective contact time (t)	27.00 minutes	0.00 minutes
Minimum free chlorine concentration after (t)	0.5 mg/l	
Effective Ct after (t)	21.60 mg·min/l	0.00 mg·min/l
Total Effective Ct after (t)	21.60 mg·min/l	

Effective Ct - Pipelines

Pipe	No. 1	No. 2
Internal diameter	0.25 m	
Length	300.00 m	0.00 m
Pipe volume	14.73 m ³	0.00 m ³
Effective contact time (t)	4.62 minutes	0.00 minutes
Minimum free chlorine concentration after (t)	0.62 mg/l	
Effective Ct after (t)	2.74 mg·min/l	0.00 mg·min/l

Total Effective Ct after (t)

24.34 mg·min/l

Instructions:

- 1) Enter site specific data into blue cells.
- 2) Grey cells, select from drop down box.
- 3) Total effective Ct after (t) must be greater than target Ct.

v4.0

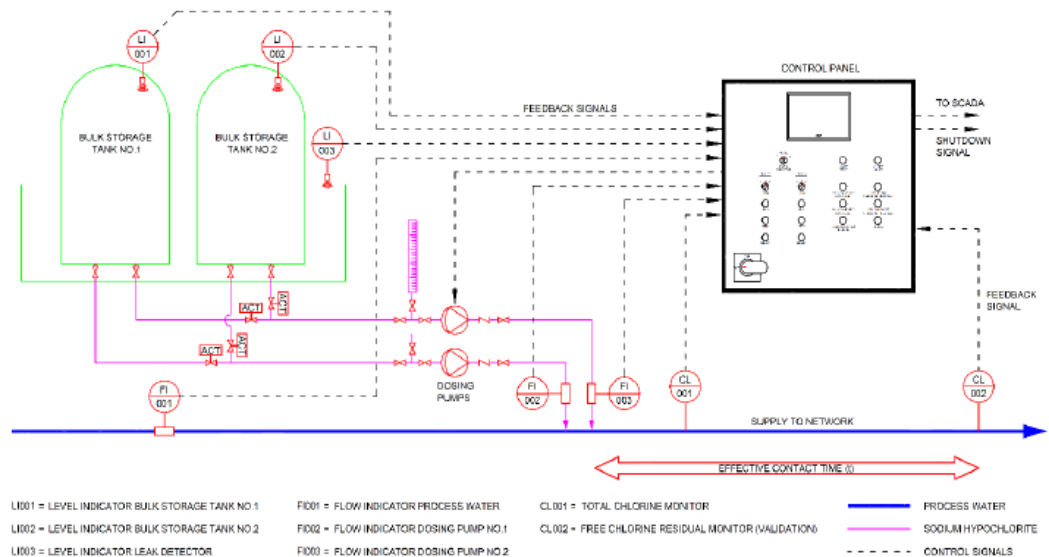
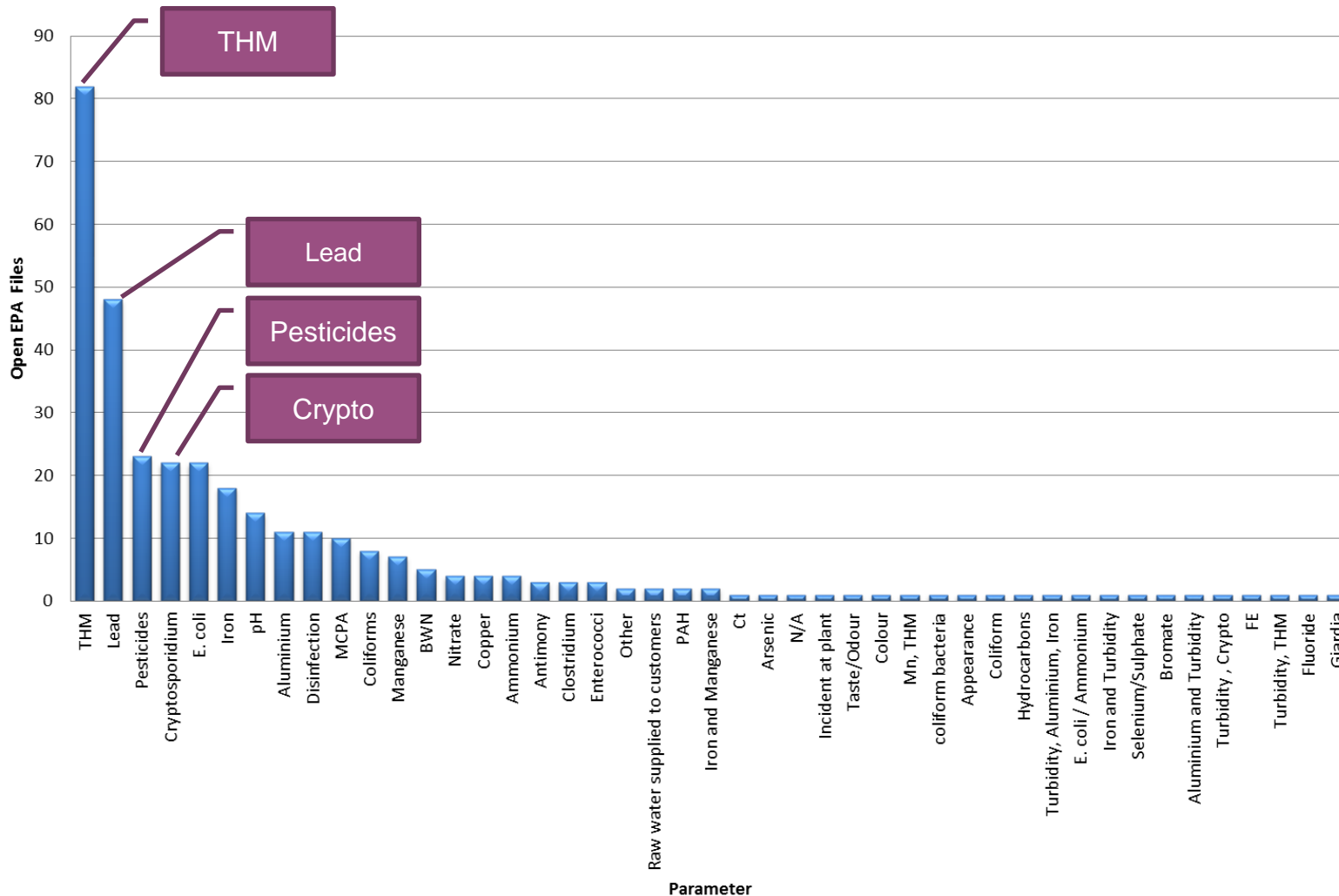
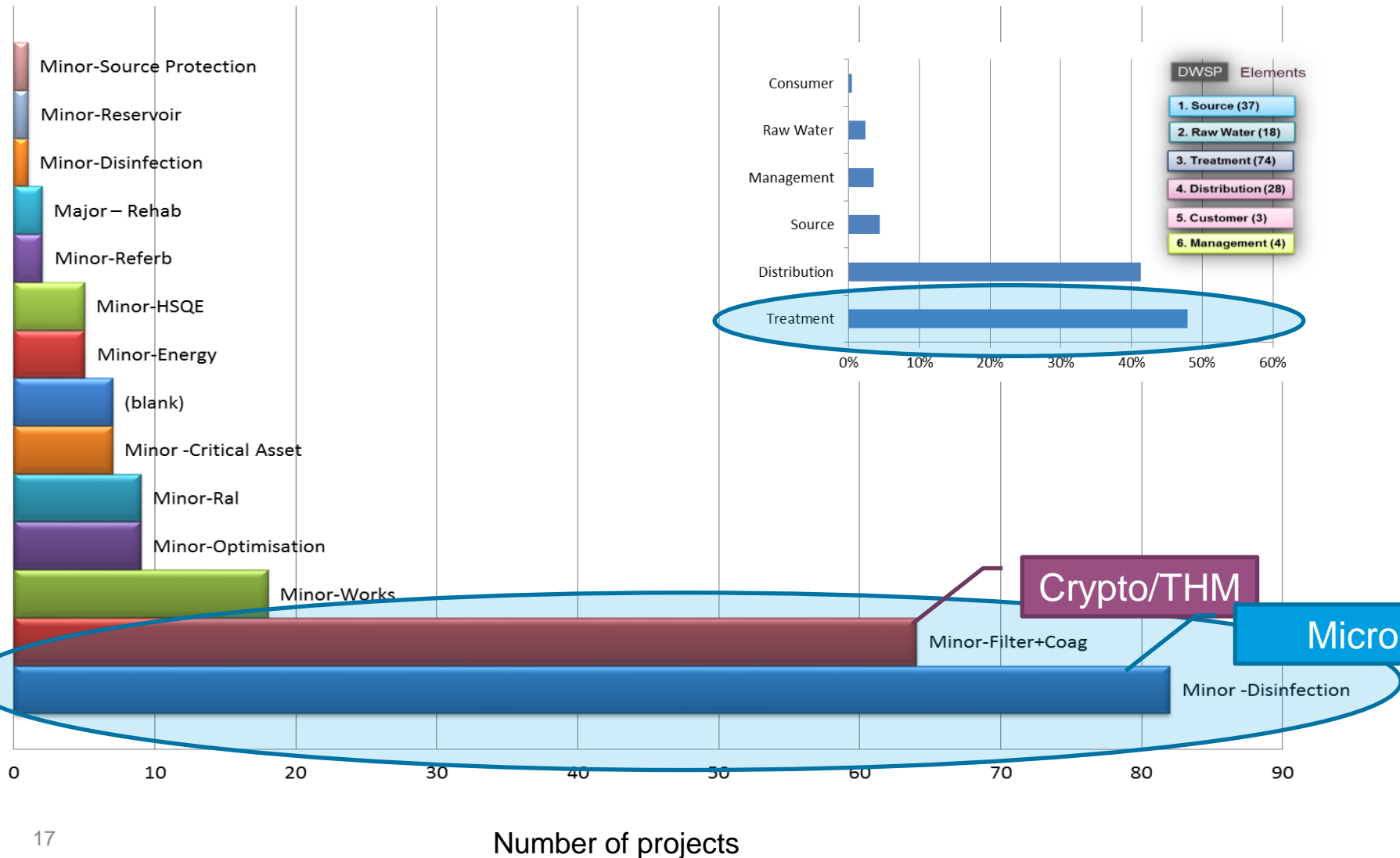


Diagram 1: Schematic of General Design No.1 – Flow Proportional Control only
(Bulk tanks shown are each in excess of 250 litre capacity, i.e. 2 No. tanks within a common concrete bund)

EPA Enforcement Priorities

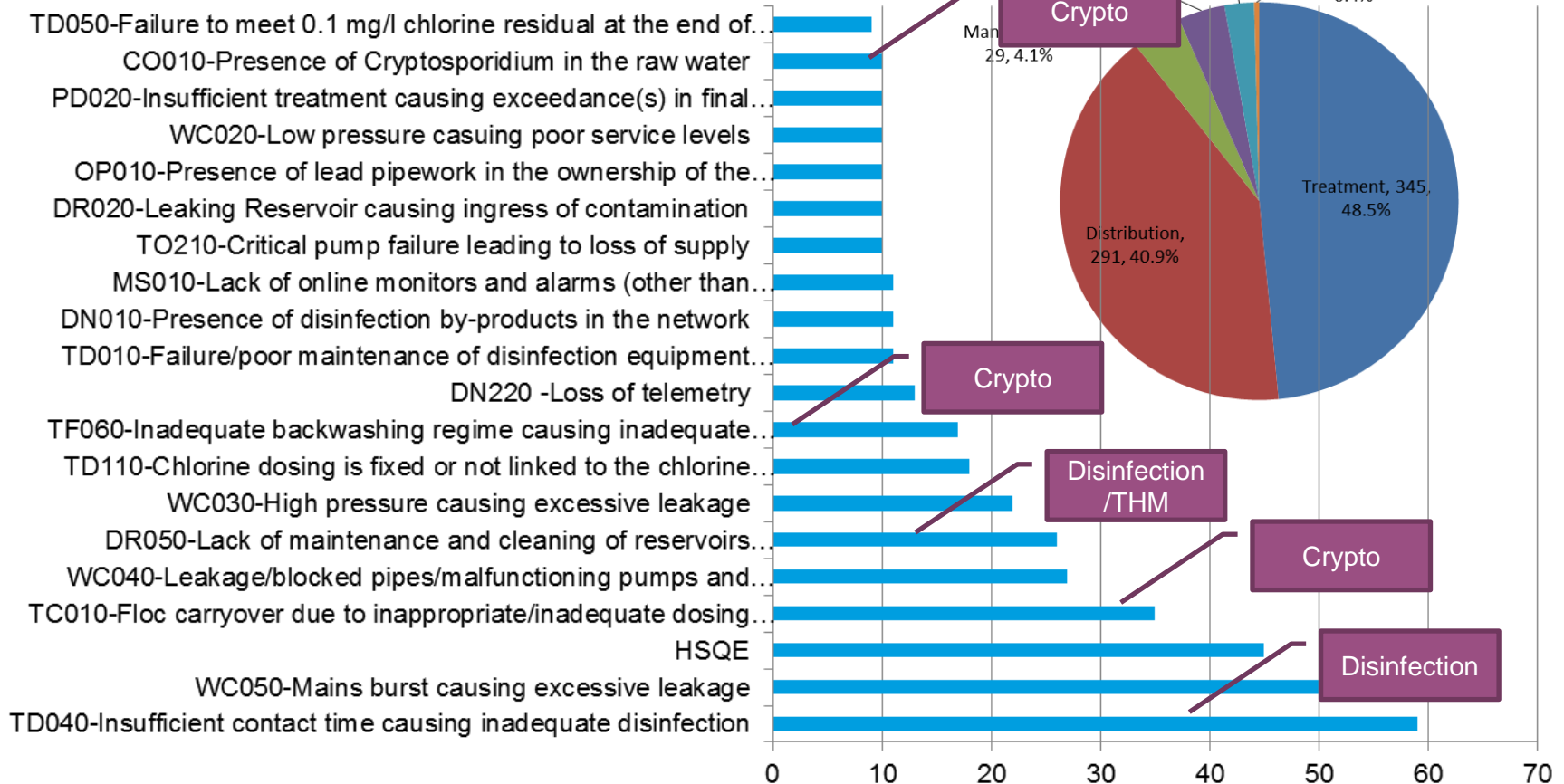


Minor Programmes: Delivering Benefits



Identified Priorities: ANB

ANB - Top 20 Hazard Breakdown



Bridging the Gap:

- Programme identifies gaps and DWSP hazardous events on site
- Applies IW standard specification

Baseline

Current

Target

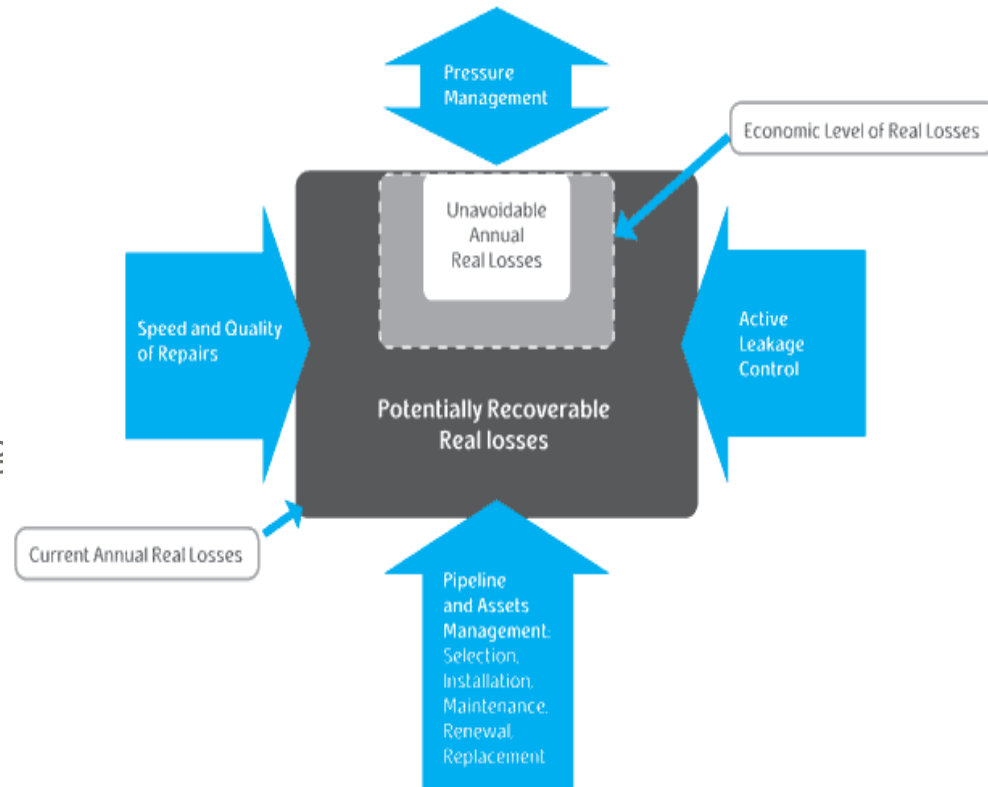
6 Irish Water Drinking Water Safety Plan Risk Assessment

DWSP Hazardous Events/Elements/Sub-Elements										Current RA Scores										Target RA Scores									
No.	Hazard Code	Hazard Title	Element	Sub-Element	Applicable (Yes/No)	Baseline Severity	Baseline Likelihood	Baseline Risk	Background/Description of Risk Rating Assessment considerations	Mitigation Measure 1	Mitigation Category	Mitigation Description 1	Validation 1	Current Severity	Current Likelihood	Current Risk	Proposed Mitigation Measure 1	Mitigation Category	Proposed Mitigation Measure 1	Proposed Mitigation Category	Proposed Mitigation Description 1	Proposed Mitigation Category	Proposed Mitigation Description 1	Proposed Mitigation Category	Proposed Mitigation Description 1	Proposed Mitigation Category	Proposed Mitigation Description 1	Proposed Mitigation Category	Proposed Mitigation Description 1
1	CO003	Presence of Cryptosporidium in the raw water	1. Source	General Catchment		5	5	25	Overall Crypto Risk Screening Score = 27	UV Disinfection	UV/A	Operator Records maintenance and service activity		5	5	25	Provide validated UV System. Provide dedicated UV Control Panel with Disturb Alarms.	5) UV Infrastructure/ Upgrade	Provide PLC Control of UV Panel with alarms	5) UV Infrastructure/ Upgrade	Return to site one month post upgrade to inspect. Run monthly alarm test by operator	5	5	5					
32	TD003	Failure/poor maintenance of disinfection equipment causing inadequate disinfection	2. Treatment	Disinfection	Yes	5	5	25	UV Disinfection is sole form of Primary treatment. No Chlorine Disinfection currently taking place.	No Chlorine Disinfection taking place	UV/A			5	5	25	Install Residual Chlorine Disinfection system	5) UV Infrastructure/ Upgrade	Install equipment to meet with requirements	5) UV Infrastructure/ Upgrade	Return to site one month post upgrade to inspect	5	5	5					
33	TD003	Failure of automatic switchover arrangements of disinfection equipment causing inadequate disinfection	2. Treatment	Disinfection	Yes	5	5	25	UV Disinfection is sole form of Primary treatment. No Chlorine Disinfection currently taking place.	No Chlorine Disinfection taking place	UV/A			5	5	25	Install Dosing Pumps & Provide Automatic Switchover	5) UV Infrastructure/ Upgrade	Install Pumps to allow Duty/Standby	5) UV Infrastructure/ Upgrade	Operator checks the switchover once monthly	5	5	5					
34	TD003	Failure to respond to a dial out alarm in the event of failure of key disinfection equipment causing inadequate disinfection	2. Treatment	Disinfection	Yes	5	5	25	Assumed system is currently not working					5	5	25	Provide dedicated Chlorine Dosing Control Panel with Disturb Alarms.	5) UV Infrastructure/ Upgrade	Provide a Control Panel which will generate alarm on failure to respond to alarm	5) UV Infrastructure/ Upgrade	Return to site one month post upgrade to inspect	5	5	5					
35	TD003	Insufficient contact time causing inadequate disinfection	2. Treatment	Disinfection	Yes	5	5	25	UV Disinfection is sole form of Primary treatment. No Chlorine Disinfection currently taking place.	Disinfection taking place	UV/A			5	5	25	Install Residual Chlorine Disinfection system	5) UV Infrastructure/ Upgrade	Install equipment to meet with requirements	5) UV Infrastructure/ Upgrade	Return to site one month post upgrade to inspect	5	5	5					

Distribution

Water Conservation Strategy

- Balance Investment across
 - *Active Leakage Control*
 - *Pressure Management*
 - *Speed and Quality of Repairs*
 - *Asset Management: e.g. Renewal, Maintenance*
- Lever for Supply/Demand balancing
- Nationwide Water Network Management Systems
- First Fix Scheme
- Implement Strategy for Change to generate Opex and Capex Efficiencies



Priority Activities

DMA Infrastructure – Rebuilding the Foundations

Re-Establishing DMA Operability

Standardising Water Auditing

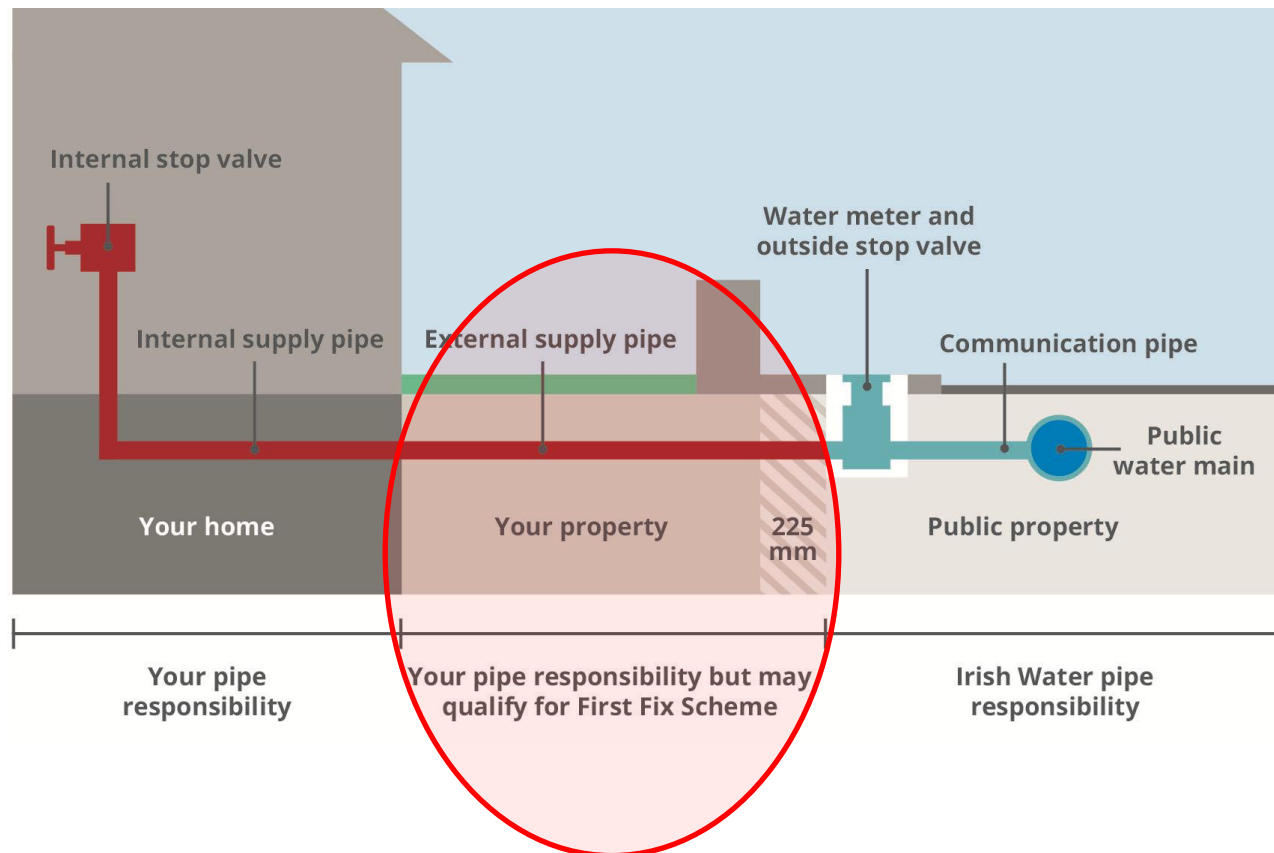
Develop Water Conservation Strategies

- Greater Dublin Water Supply Area Strategy
- National and Regional Strategies
- Customer Side Leakage Strategies

Ensure continuation of the capital investment programme

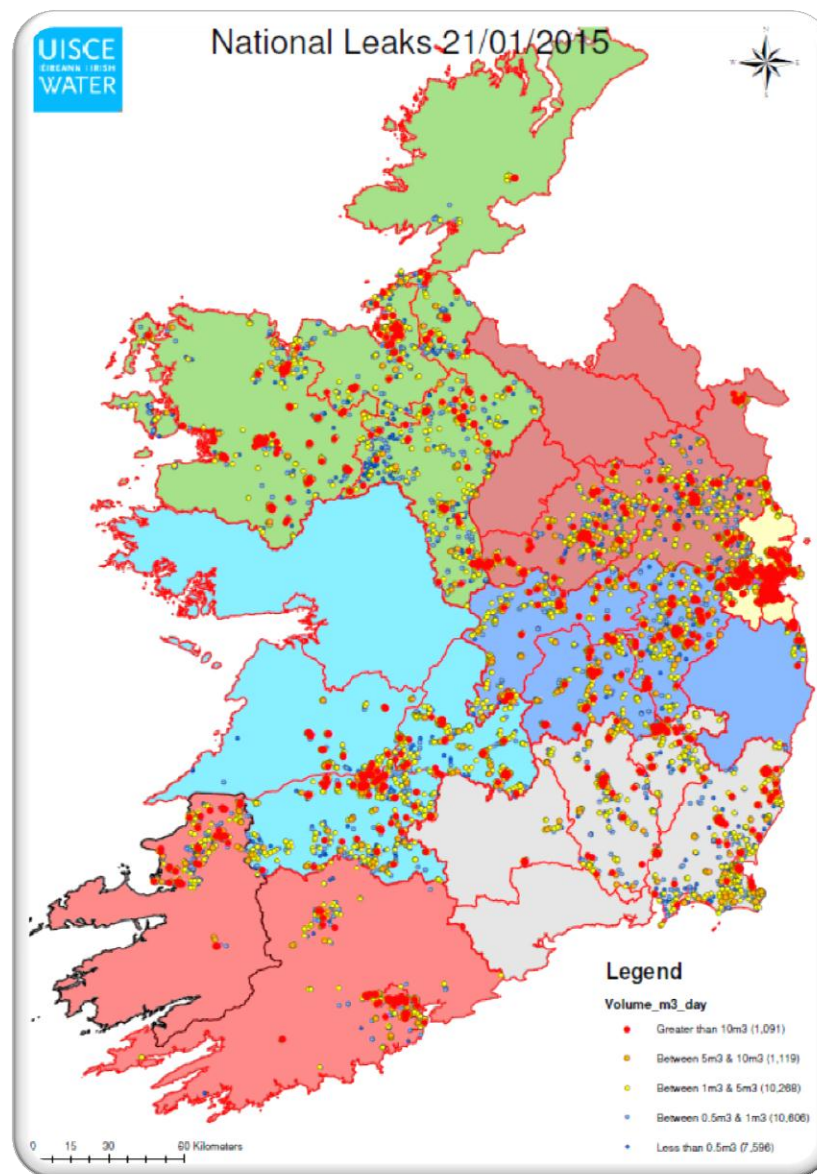
First Fix Scheme

For customers where meter information indicates high levels of leakage, Irish Water will identify and repair of leaks on the private supply pipe



First Fix: Meters Providing Leak Data

- ✓ The location of thousands of meters with active leak alarms can now be identified.
- ✓ Leaks can be prioritised based on size
- ✓ This data will be used to inform targeted communications by the First Fix programme
- ✓ National roll out in Q2 2015



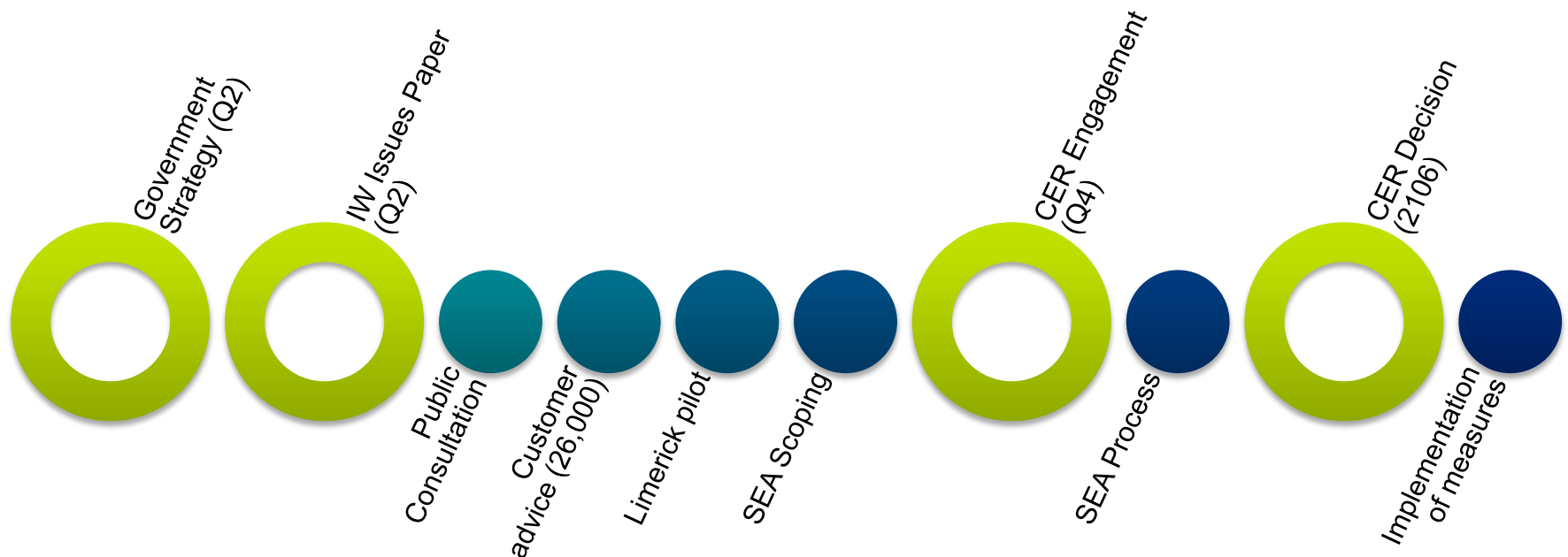
Irish Water THM

- EU PILOT - 7544/15/ENVI request
- Process upgrades (Short Term)
 - *Disinfection process upgrades - Minor Programmes*
 - *Coagulation process upgrades to - Minor Programmes*
 - *Reservoir refurbishment and cleaning upgrades - Minor Programmes*
 - *Pilot to test THM air-stripping technologies and their application to IW assets*
- Water Treatment Plant process optimisation by our Operations Support Services teams
- Customer Information: Online Drinking Water Quality
- Decommissioning or upgrade under Major Capital Programmes (Medium Term)
 - *typically install coagulation processes*

Customer

Lead: Update

- 8th June 2015: First letters and advice arrive to over 600 customers in Limerick based on lead information from the metering programme. Note: 26,000 advice letters pending.
- 9th June 2015: Government published a [national strategy](#) to reduce exposure to lead in drinking water
- 16th June 2015: Irish Water published [Lead in Drinking Water Mitigation Plan – Issues Paper](#)



Lead: proposed measures

- Extensive sampling programme
- Information for households
- Customer service connection Opt-in scheme supported by government grant
- Risk Prioritised:
 - *Replacement of the public connection pipes, and any other types of lead connections, under a long term planned programme.*
 - *Optimisation of the treated water (e.g. control of pH and ortho-phosphate dosing).*
- Research:
 - *chemical lining systems (Dundalk)*
 - *ortho-phosphate as corrosion treatment (Limerick).*

Management

Managing the Assets: Define and Understand

- Who needs to know?
- Identifying failure?
- Under performance?
- How is it measured?
- What accuracy is required?
- Measurement frequency?
- Data logging / display
- Alarms
- Controls
- Defining the right response

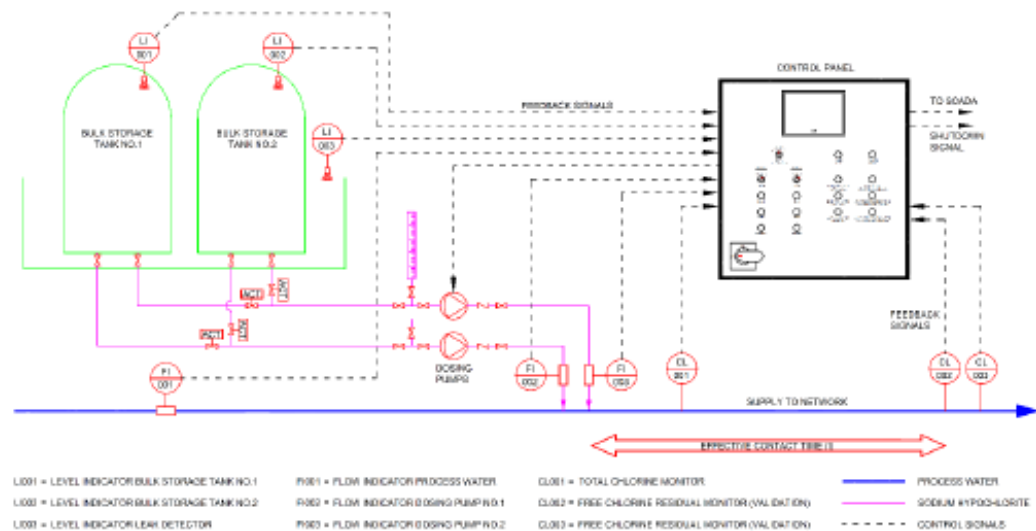


Diagram 2: Schematic of General Design No.2 – Flow Proportional Control
(Bulk tanks > 250 litres, common concrete bund, dual validation of Ct value provided by CL002 and CL003)

- Bacterial compliance monitoring requirements for chlorination (primary disinfection) are as follows (separation between data records must be less than 1-minute):

Parameter	Location	Frequency	Critical Control Point	Alarm	Compliance duration
Turbidity	Treated water	Continuous	>1.0NTU	>0.8NTU	Any 3-minute period
	Treated water	Continuous	>2.0NTU	>1.5NTU	Any 1-minute period
	Treated water	Continuous	Treated water turbidity > raw water turbidity		Any 3-minute period
Total chlorine	Treated water (before contact tank)	Continuous	<0.4mg/L	>0.5mg/L	Any 3-minute period
Free chlorine	Disinfected water (after contact tank)	Continuous	<0.5mg/L	>0.6mg/L	Any 3-minute period
pH	Treated water	Continuous	> Maximum design pH	>0.8 Maximum design pH	Any 15-minute period
Flow	Treated water	Continuous	>maximum design flow m ³ /hr		Any 15-minute period

Asset Management Systems and processes

Service
Layer



Customer



Industry

The reason for our being.
The service and regulatory structure in which we woperate

Business
Application
Layer



Investment
Planning



Regulatory
Reporting



CO₂
Energy
Management



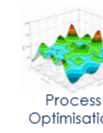
Leakage
Management



Customer
Contact



Maintenanc
e
Management



Process
Optimisation

Typically 400
applications
1/3rd rely upon
asset
performance
information

Corporate
Information
Layer



Customer



GIS



ODS



WAM

Corporate
data
repositories
Work/
Customer/
Asset
Performance

Supervisory
System
Layer



Logger data
3rd Party
FTP server(s)



Communication Network



Logger data
3rd Party
FTP server(s)

Control Centre
- moving
towards real
time Asset
Management

Instrumentation,
Control and
Automation
Layer



Borehole



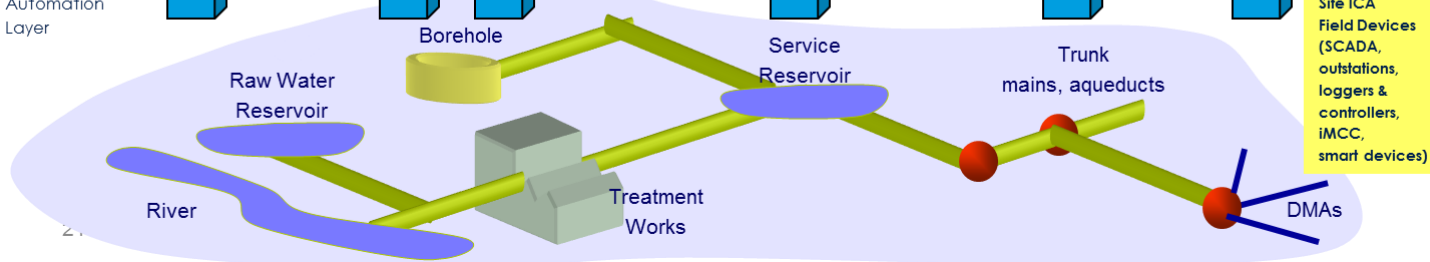
Service
Reservoir



Trunk
mains, aqueducts



Site ICA
Field Devices
(SCADA,
outstations,
loggers &
controllers,
iMCC,
smart devices)



Asset Management Systems and processes

- It's not about data
- It's not about systems
- It's not about people
- It **is** about data, systems and people



Asset Management Systems and processes

35

- **Remote Asset Management (RAM) Policies**
 - *Risk based, rules approach for each asset type*
 - Alarm Response
 - What asset or process **failure** conditions we measure and how we will respond
 - Performance Measures
 - What asset or process **performance** conditions we measure and how we will respond

Example Policy – Alarm Response

Risk

37

ID	Plant Condition	Site Condit' n	Wait Mins	Recipie nt	Intervention	High	Time to Clear Medium	Low	Skill	Comments / Assumptions
1	Any Pump Failed	DWF	60	Field	Attend & Resolve	3d	7d	14d	FO	WWH provides back-up alarm and Both Pumps Failed provides back-up alarm
		Storm								
2	Both Pumps Failed	DWF	0	Field	Attend & Resolve	SD	SD	ND	FO x 2	Most of the time this is a 2 man job therefore attend with 2 Operators

ID	Signal	Measure	Busines s Driver	Recipient	Intervention	Signal Criteria	Comments / Assumptions
4	Pump X Running / Stopped	Monthly Station Hours Run deviation If hours run is 15% > than previous 12 months	OE & GR	Maintenance	Investigate change in station efficiency and rectify if possible Refer to Asset Management (after Ops intervention) for decision on Invest or Propex	Change of state time stamped to nearest second	Increase in demand due to: <ul style="list-style-type: none"> Infiltration Growth
5	Pump Starts	Number of Pump Starts per day deviation report	OR & OE	Analyst	Eliminate storm events and known issues then diagnose fault and pass to dispatch as P3 work	Count to the nearest whole number	Significant changes in starts per day could be a failing control system or instrumentation

RAMs in Action



In the Return to Service Process

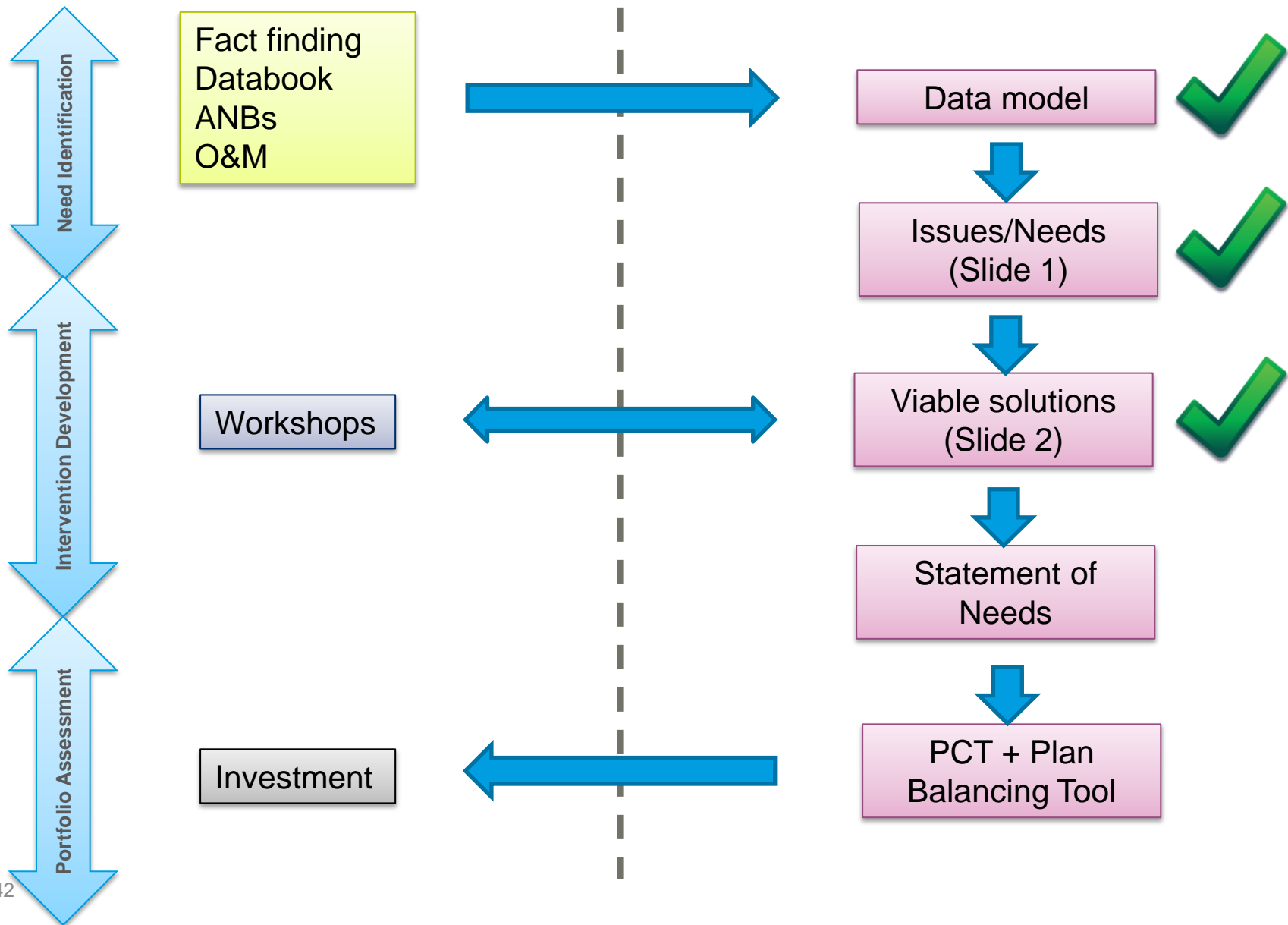
Alarm Condition	Work Allocation	Return to Service
Alarm Logic definition & Time Delay Implementation to give alarm volume reduction Alarm Reprioritisation	Alignment between alarm and work priorities Improved Alarm Handling/Work Raising	Clearer work instructions Less disrupted work schedules

Investment Planning

IPC2 / PRW1 – Project Objectives

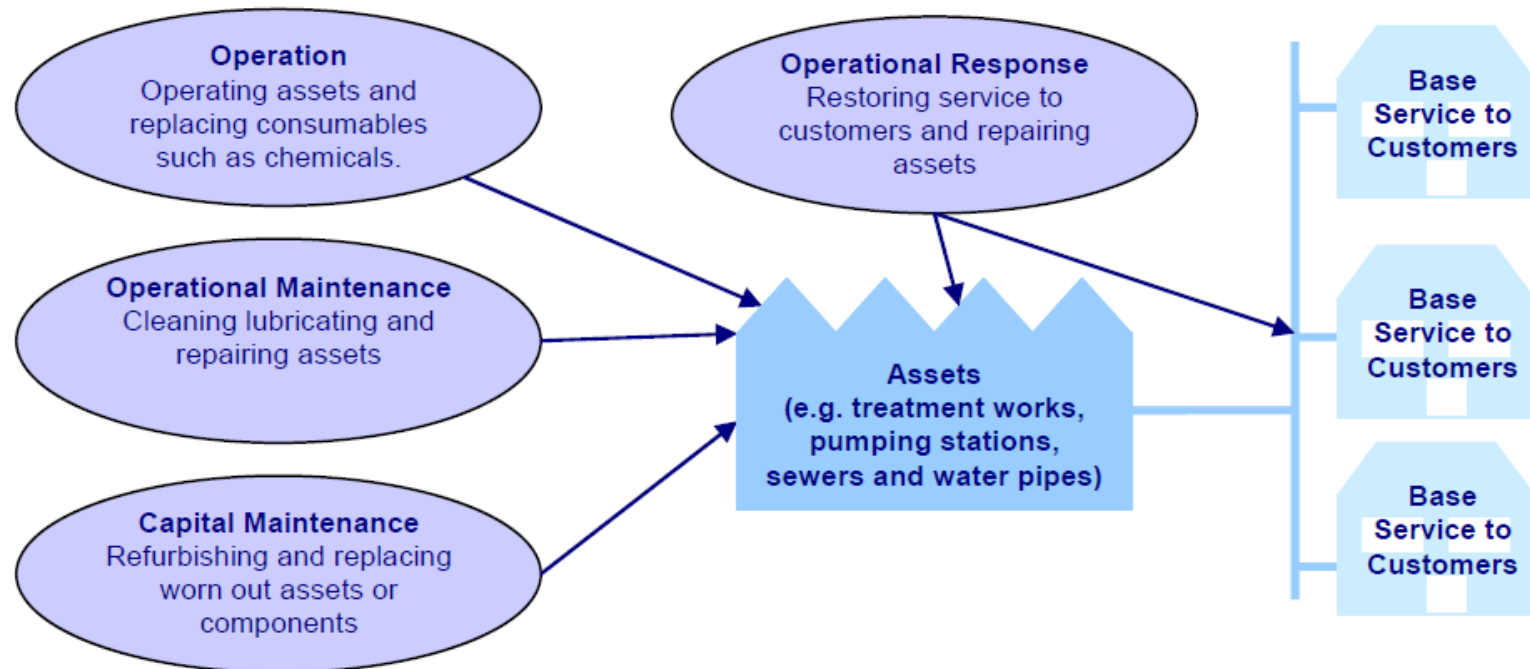
- Development of the draft Capital Investment Plan
- Interim Price Control 2 – IPC2 (2017 - 2018)
- Price Review Water 1 (2017 – 2021)
- Targeting;
 - *Evidence based approach to support investment to meet customer and environmental objectives;*
 - *Asset Condition and Performance assessment based on IW Asset Policies and Strategies;*
 - *Taking into account IW Strategic Objectives; and*
 - *Ensuring Key Stakeholder and Customer Engagement;*

Building case for investment



Asset Maintenance

Sustain levels of service to Customers



Water Infrastructure CIP Programmes

National Programmes

Lead
SCADA/Telemetry
Leakage Management System
HSQE

Capital Maintenance (Sustain Service)

Reservoirs and Impoundments
Water Treatment
Water Conservation
Meter Asset Management

Major Programmes (Regional)

Water Treatment
Water Conservation

Minor Programmes (Regional)

Disinfection
pH Correction
Filtration
Coagulation
Reservoir Refurbishment
Distribution Water Quality
Source Protection
Pressure Management
DMA Establishment
Mains Rehabilitation
Energy Management

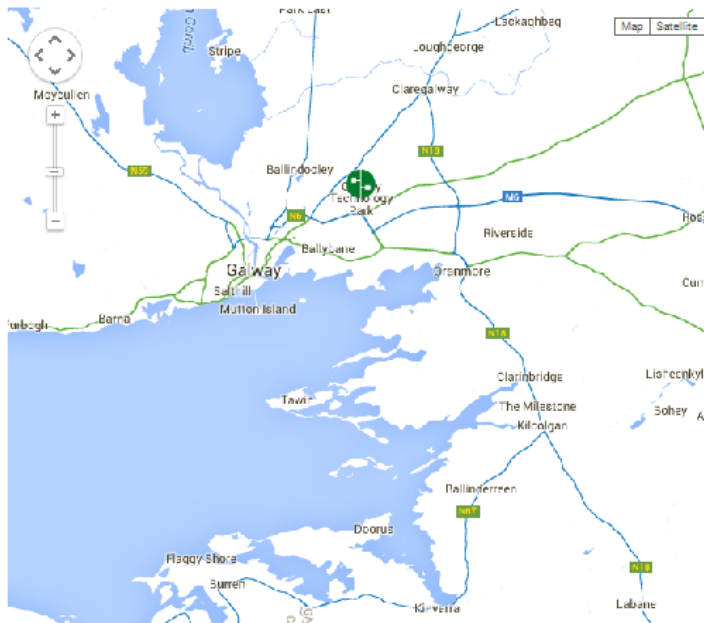
Online Water Supply Information

Customer Engagement: Online Supply and Service Updates

- In this Water Quality section you can:
- Search for your Water Supply Zone using the search tool below or by using our map
- Learn about the different [parameters tested for in drinking water](#) (microbiological, chemical and indicator parameters)
- Access [drinking water quality FAQs](#)
- <http://www.water.ie/water-supply/water-quality/>

Customer Engagement: Online Supply and Service Updates

Supply and Service Updates Map List



FILTER

Alert Type






All alerts

County

All counties

SEARCH


MAP ICONS

-  Boil Water Notice
-  Informational
-  Network Incident
-  Pollution
-  Water Outage

NETWORK INCIDENT Essential Maintenance Works - Leitrim [view](#)

[on map](#)



South Leitrim Regional Water Supply Schemes

15/06/2015 - 19/06/2015  Planned

Essential maintenance works may cause supply disruptions to Mohill, Kilnagross, Gortnafadda, Kilclare, Drumshanbo, Gortvagh, Kiltoghert, Drumsna, Finnerlaghta, Roosky, Avghavas, Carrick-on-Shannon, Mountcampbell, Jamestown, Leitrim Village, Carrigallen, Newtown Gore and all surrounding areas supplied by the South Leitrim Regional Supply schemes.

Works are scheduled to be carried out at 08:30am on 15/06/2015 and have an estimated completion time of 05:30pm on 19/06/2015.

NETWORK INCIDENT Burst Water Main - Dublin [view on map](#)

Tallaght  13/06/2015  Unplanned












Repairs to a burst water main may cause supply disruptions to Tamarisk Avenue and surrounding areas in Tallaght, Dublin 24.

Live Information updates

- **Alert:** Outage/Boil Water etc.
- **Start:** 08:30am on 15/06/2015
- **End:** 05:30pm on 19/06/2015
- **Areas affected:**

Customer Engagement: Online Supply and Service Updates

11 Drinking Water Parameters

2015		2014				
Parameter	Unit	Samples Taken	Exceedances	Pending Review	Not Applicable	% of Samples within Exceedance Limit
 Aluminium	µg/l	62	0	0	0	100%
 Clostridium perfringens	cfu/100ml	62	0	0	0	100%
 Cryptosporidium	Count/No. per 10 litre	24	0	0	0	100%
 E. Coli	MPN/100ml	62	0	0	0	100%
 Enterococci	cfu/100ml	62	0	0	0	100%
 Iron	µg/l	62	0	0	0	100%
 Lead	µg/l	9	0	0	0	100%
 Trihalomethanes		62	0	0	0	100%
 Trihalomethanes (THMs) are a chemical parameter and are typically formed by the reaction of chlorine (used to disinfect the water) with natural organic substances in the water. The limit for THMs in drinking water is 100µg/l. For a full definition and explanation of trihalomethanes, please visit our parameter page.		62	0	1	0	100%
		8	0	0	0	100%
		110	0	0	0	100%

Number of Samples

Number of Exceedances

Simple Explanatory notes

A drinking water sample which is above the maximum acceptable limit as set out in the [European Union Drinking Water Regulation](#) (HSE) of all drinking water exceedances and seeks their advice in relation to the protection of public health. Please be advised that all drinking water quality results shown here have been reviewed and assessed in terms of compliance with the drinking water regulations. All identified exceedances have been submitted to the HSE and where the exceedance has been deemed a risk to public health, all affected customers will have been notified. You can [view](#)

Thank You!

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