# 21<sup>st</sup> ANNUAL LEAKAGE CONFERENCE 8-9 FEBRUARY 2021

## Find and Fix Forum – Leakage Sprint

#### Find and Fix Forum – Leakage Sprint: fixing and repair solutions

- Chaired by Peter Simpson, CEO, Anglian Water
- Introduction to the NWG Innovation Festival and the sprint
  - Andrew Blenkharn, Network Performance Coordinator, Northumbrian Water
- The transformation map an interactive session
  - Rebecca Haylock, Project Manager (Consultant), UKWIR
- Sprint Concept 1 micro excavation and leak location
  - Dennis Dellow, Technical Lead for Leakage (Consultant), UKWIR
- Sprint Concept 2 letting the fix find the leak, the potential of DMA MoT
  - Mick Baker, Tactical Planning Manager, Northumbrian Water



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## Leakage sprint: Fixing and Repair Solutions

#### Leakage conference 2021, Feb 9<sup>th</sup>

Andrew Blenkharn, Rebecca Haylock, Dennis Dellow, Mick Baker





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## Introduction to the NWG Innovation Festival and the sprint

Andrew Blenkharn

Network Performance Coordinator, Northumbrian Water





	2019	2020
Registered attendees	>3000	2730
NWG/ESW employees	>300	645 (519/126)
Organisations	734	900
Sponsors	38	57
Countries taking part	<5	37
Water companies	13 (UU, Anglian, Yorkshire, Welsh, Portsmouth, Northern Ireland, Irish, Affinity, Southern, NWG, Scottish & Wessex)	16 (UU, Anglian, Yorkshire, Welsh, Portsmouth, Northern Ireland, Irish, Affinity, Southern, Scottish, Bristol, South West, South East, Severn Trent, Thames, & Wessex)
Universities	9 (Newcastle, Durham, Northumbria, Cranfield, Loughborough, De Montford, Exeter, Sunderland & UCL)	22 (Newcastle, Durham, Northumbria, Sunderland, Teesside, Essex, Dublin, Leeds, Cranfield, Loughborough, Sheffield, Manchester, Middlesex, Warwick, Strathclyde, Glasgow, Exeter, Nottingham, Bangor, Central Florida, Siegen, Osnabruck)









## OUTPUTS

- >4000 ideas
- 100 BIG ideas including
- 24 devices
- 10 platforms/collaboration spaces
- 6 Apps
- 2 business models
- 9 dashboards/digital solutions
- 11 concepts/campaigns/insights





#### **UKWIR BIG QUESTIONS** – zero leakage and zero interruptions



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#### Innovation heatmap

#### Project counts and total scores by project types

All new pipework is leak-free		New leaks on existing networks are minimised		We can confidently quantify leakage and demonstrate when it is zero				
Pipe & fittings installation practices	3	52	Network pressure optimisation	17	310	Quantify trunk main leakage	4	60
Pipe and fittings installation standards/qualif	1	8	Mains condition surveying	14	274	Quantify supply pipe leakage	2	29
Improved pipe fittings	1	21	Network calming	19	317	Quantify property leakage / allowances	45	872
			Dynamic/Optimised networks	4	65	Quantify network leakage / allowances	6	87
			Mains laying programme optimisation	8	120	Leak calculation convergence	1	21
			Mains deterioration prevention			Quantify storage losses	1	19
			Supply pipe repair/reclatement	11	154	Top down/bottom up calculation alignment	8	119
All new leaks are found quickly after they b	reak out		Repairs are quick, economic with min. disrup	tion		Background leakage is eliminated		
Trunk main leakage awareness	7	97	Micro excavation	4	63	Ultra low leakage awareness		O
Trunk Main leakage location	14	294	Internal repair methods	12	201	Ultra Ic v leakage detection		
Network leakage awareness	42	768	Temporary repair methods	4 70Ultra lov leakage repair		)Ultra lo <mark>u</mark> leakage repair		o
Network leakage location (acoustic)	26	473	Repair process optimisation	15	292	Pipe conditioning methods		0
Network leakage location (non acoustic)	50	. 59						
Supply pipe leakage awareness								
Supply pipe leakage location	9	157						



#### **Mission:**

How do we achieve *increased repair speed* & *quality, at lower cost, with less disruption to customers, communities* & *environment*?

How do we **mitigate the effect of the increasing numbers of leak and burst repairs required to meet ongoing commitments** to step change improvements in leakage and supply interruption performance?

#### Aim:

To *identify development opportunities to improve the effectiveness of repairs on the network* measured by cost reduction, disruption to supply and the environment reduction, time reduction.









### Delegates

- Sprint team = 47
- Core team = 20

Organisation	Delegates	
UKWIR	4	
Water companies	21	
Suppliers/contractors	16	
Other Utilities	2	
Random	4	





#### **Design Sprints**





#### **Lessons learnt**

3 days isn't very long

The digital tools worked really well but couldn't replicate the atmosphere of the festival

Lots to learn from other utilities

Water networks are difficult

Amazing commitment from all involved







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## The transformation map – An interactive session

Rebecca Haylock

Project Manager (Consultant), UKWIR

### Valuable discussions over the 3 days of the sprint...

- Sprint developed 2 specific leakage repair solutions
- However, wider areas discussed and captured to address the key sprint goal:-

"How do we increase leakage repair speed and quality, at lower cost, with less disruption to customers, communities & the environment?"

- Captured the valuable insights via Miro, e.g.
  - Factors affecting the challenge
  - Top priorities to tackle to achieve our mission
  - Mapping existing solutions and approaches





### **Transformation Map captured the content...**

- Created Transformation Map to capture key themes and actions
- Grouped & refined into tangible actions for next 5 years & beyond:-
  - 1. Easing the Regulatory burden
  - 2. Incentivising the supply chain
  - 3. Appetite for investment (funding)
  - 4. R&D & Innovation
  - 5. Systems & technology
  - 6. Cross sector collaboration & learning from other industries
- Also captured:
  - Key stakeholders who do we need to engage and when?
  - $_{\circ}~$  Solution vendors/providers e.g. from gas and oil





#### **Transformation Map**

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Easing the Regulatory burden	2020 2021 Work with Water UK - create information note to clarify Learn from gas industry model for regulatory approval an Incentivise the workforce via training & qualification (National Framework for Leak Free New Networks v	2022 Work with DWI/WRAS for innovators to under d Italse with DWI via Water UK Devise mechanisms to reward high a the UKWIR BQ2 & BQ3 with Water UK)	2023 to create a slicker/more flexible Reg 31 approval to ma rstand and encourage innovation Encourage tenders from solution provider peer reviewed via e.g. the sprint group with provider of the service (recognising 1P) ter company procurement processes to encourage innovation	2024 onwards ke it easier	Mission: To increase repair speed & quality, at lower cost, with less disruption to customers, communities & environment.
Incentivising the supply chain	De-risk the implementation or adopt approaches / sharing costs and resu Capturing and sharing knowledge from repairs (successful or to help and incentivise the development of new products (por Enco	ion of new technologies or methods by joint ts not) tentially via new NFD) urage the support of shareholders for innovation and	ing the length of time required (i.e.		
Appetite for investment (funding)	Utilise the Ofwat innovation fund where appropriate Look into potential funds from e.g. DfT Establish Streetworks permitting schemes, ORCA, RAIN, TAG etc to help encourage innovators Look how the gas industry has used the Networ Innovation Allowance and follow for Ofwat Fu Encourage suppliers to solve the sprint question - link to innovation funds - adverts etc	2 AMPs etc) what the customers wants and how much would be pay for (e.g. via Price Review discussion forums) rk nd Review outputs from this sprint and horizon scan project (via UKWIR)	follow up with wider Develop a framework for con various stages of developmen	Micro Excavation & Repair (Dennis' Team 2) sistent assessment at	MOT ept s Team Encourage and facilitate joint testing with other utilities that have common ground - water sector first then across utilities to derisk Pro-actively link up with other utilities for excavations (e.g. via one.network, local council)
	Investigate " past but with Understand key water specific constraints and fo plan to resolve (i.e. WQ, cost, conditions, pressure Use the Leakage Innovation Heat Map - now looking glo Liaison with solution providers as to technologies that have worked in other industries and apply to water, e.g. CISBOT	lead ends" that did not work in the new innovation may be a solution rmulate is etc) bally & academia Identify and follow up key techs t now (including ideas from this spin	Systems and technologies that support multiple rep Be aware that technology needs to integrate wit existing deployed performance in database, w solutions ( i.e. Leakage Hub and NFD) hat show more immediate promise rint)	airs simultaneously th legacy systems Create of enable i Tap into other indust Learning from other se development of alterna collaborate now & iden	with private plumbing industry on private leakage an engaging platform with other industries to knowledge sharing and collaboration Shared industry test bed (e.g. Kempton rig) tries networks to engage fectors (e.g. gas) who appear more advanced in ative technologies - opportunity to learn and http:/resolve.past blockers

### Further input welcomed on the Transformation Map themes below...

GOAL - "How do we increase leakage repair speed and quality, at lower cost, with less disruption to customers, communities & the environment?"

- **1.** Easing the Regulatory burden (Reg)
- **2.** Incentivising the supply chain (SC)
- **3.** Appetite for investment/funding (Inv)
- 4. R&D & Innovation (R&D)
- 5. Systems & technology (S&T)
- 6. Cross sector collaboration & learning from other industries (CSC)

#### ....WHAT? HOW? WHO?



#### Please post your suggestions in the Chat...

- For each of the 6 themes (Reg, SC, Inv, R&D, S&T, CSC) :-
  - WHAT key activity would you carry out?
  - o HOW would you conduct the activity?
  - WHO do you feel should be leading this activity?
- Please put your answers in the Chat box:-
  - Leading with the acronym (in green above)
  - Then please answer the WHAT, HOW, WHO, e.g. R&D What.... How.... Who....
- Please focus in on 1 or 2 themes, feel free to provide more than one idea for each theme!

5 mins to complete the exercise – thankyou!!

Also come and chat to us after in <u>Sessions</u> - <u>Leakage Sprint: Fixing & Repair Solutions</u>



- 1. Easing the Regulatory burden (Reg)
- Incentivising the supply chain (SC)
- . Appetite for investment/funding (Inv)
- 4. R&D & Innovation (R&D)
- 5. Systems & technology (S&T)
- 6. Cross sector collaboration & learning from other industries (CSC)

#### **Easing the Regulatory burden**

Create **information note** to clarify regulatory position Learn from **gas industry model** for regulatory approval More flexible **Reg 31** to encourage innovation

#### **Incentivising supply chain**

Sharing knowledge from repairs (successful or not) to help/incentivise De-risk implementation/adoption of new technologies by **collaboration** Devise mechanisms to **reward** high quality, quick repairs Amend company procurement processes to encourage innovation

#### **Appetite for investment/funding**

Inv **Potential funds** from e.g. DfT Streetworks, ORCA, RAIN, TAG etc Look how gas industry has used the NIA and follow for Ofwat Fund Establish how much the customer would be **willing to pay** (e.g. via PR forums) Encourage support of shareholders for innovation over more than one AMP

#### **R&D & Innovation**

Use the UKWIR Leakage Innovation Heat Map

Understand key water specific constraints and formulate plan to resolve (i.e. WQ, cost, conditions, pressures etc) Investigate "dead ends" that did not work in the past but with new innovation may be a solution Review outputs from this sprint and follow up with wider horizon scan project (via UKWIR)



#### WHAT? HOW? WHO?

Reg

SC



Track existing performance/new solutions (i.e. Leakage Hub, NFD) Be aware that technology needs to **integrate with legacy systems** Systems/technologies that support **multiple repairs simultaneously** Framework for **consistent assessment** at various development stages



#### **Cross sector collaboration & learning other industries**

Tap into other industries **networks** to engage Shared industry test beds

Link with **private plumbing industry** on private leakage Pro-actively link up with other utilities for excavations Encourage and facilitate joint testing with other utilities



#### In summary...

- Transformation Map developed during the 3 day sprint and now needs moving forward
- Mindful of barriers to implementation and how to overcome:-
  - How can we make easier and more viable? Learn from e.g. gas industry
  - Identify and ease key blockers and constraints
  - Encourage and be open to wider cross sector collaboration
  - Clarify and promote funding routes and encourage and incentivise investment in innovation
- Email me if you would like a copy of Transformation Map V1 and/or would like to input further:-
  - rebecca@brio.co







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## Sprint Concept 1 – Micro excavation and leak repair

**Dennis Dellow** 

Technical Lead for Leakage (Consultant), UKWIR

#### **Micro-excavation and leak repair**

#### **Our proposition:**

To develop a way to repair a leak, leaving the smallest possible footprint, at low cost and with minimum disruption, using micro-excavation and keyhole leak repair.



#### **Our objectives:**

- Reduce costs and increase productivity to maintain customer bills at affordable level.
- Reduce interruptions to supply through speedier repair whilst still maintaining pressure.
- Reduce the area of work to minimise disruption to road users and pedestrians.
- Improve customer experience and C-Mex.



## **Micro-excavation and leak repair**



- Location
- Excavation
- Repair
- Reinstatement



Where we need research and development:

- Pin-point accuracy of pipe and leak location
- Down-hole leak repair in a micro excavation
  - All work done from the surface.







Step 1 - Coring machine





Step 2 - Remove soil with vacuum excavator





Step 3 - Repair leak





Step 4 - Compact soil





Step 5 - Replace core



## **Repair options**

- Develop long handled tools to carry out repair using a conventional repair clamp.
- Design a modified repair clamp and tools specifically for repairs in a micro-excavation.





# New UKWIR project : Transferring minimal excavation methods into the water industry

- Micro-excavation methods already used by UK gas industry and by water utilities in some other countries.
- Very little use in UK water industry
- Project will assess methods used elsewhere, and identify the issues and barriers to deployment in the water industry
- Develop functional specification to facilitate application for innovation funding.
- Expressions of interest received. Project is about to go out to tender.



## Leak location: PhD projects about to start at Southampton

### University

- Use of insertion rods inserted vertically along line of pipe, in contact with the pipe, within a few metres of the leak.
- Would provide additional access points for correlation, and should allow more accurate location of the leak.
- To start September 2021
- Multi-sensor array on ground surface, using geophones, laser vibrometers, etc.
- New analysis methods for use with synchronised ground vibration measurements.
- Start to be agreed.





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## Sprint Concept 2 – Letting the fix find the leak, the DMA MoT

**Mick Baker** 

Tactical Planning Manager, Northumbrian Water



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# Letting the fix find the leak ! Using emerging pig and gels technology

The Squirts

# The Issue – cost to find and cost to fix





# Why do we need to change our approach?

- Affordability against future bills
- Hitting future leakage targets
- Current Find and Fix approach is not going to be as effective
- Industry is not moving at the pace required
- Value of sensor technology is not yet proven for the extensive system integrations needed
- New innovation model and approach needed



le you paper in to 8 and get sketching!





# Solution – The DMA "MOT" concept

Advanced treatment of a single DMA (or section of DMA) to make it leak free using an in-pipe solution (e.g. pig and gel systems)

Lower cost and disruption to customers and public Defers need for full scale network replacement

Potential to address background leakage

The natural rate of rise of leakage can then be controlled through sensors until more long-lasting pipe replacement systems are developed

Can be part of servicing your DMA

- Leakage management find and fix, periodic reduction in low level background leakage
- Water quality management mains flushing etc
- Asset condition and DMA design & performance assessments



# **MOT TESTING**



#### VEHICLE TESTING STATION APPROVED BY THE DEPARTMENT OF TRANSPORT

## **Barriers to Success**

- Regulatory challenge we need to engage and gain support from our regulators
  - ITS challenge
  - Quality challenge
- Customer perception
  - Communication and engagement plan will be required
- Incentivisation through opening market potential







## The Future

Silent street works – no impact on our communities whilst delivering record reduction in leakage across our networks









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## **Any Questions?**