### Water and **Environment Support**

in the ENI Southern Neighbourhood region



## Working session with Peers: SOPs and WGs

Peer-to-Peer (P2P) Exchange on Non-Revenue Water Management (RW-6-P2P)

June 21, 2023, videoconference

Cor Merks, Senior Expert on Non-Revenue Water reduction management (NKE1)

Andreea Florea, Young Water Professional









- **11:00 11:10** Meet & Greet (AII)
- **11:10 11:30** Lessons learned from the training in Athens during January 16-20, 2023 (AII)
- **11:30 11:40** Summary of the evaluation of the regional training (Andreea)
- **11:40 12:10** Summary of identified Standard Operating Procedures (SOPs) (Cor)
- **12:10 12:35** Selection of max. two (2) SOPs to be developed (All using Mentimeter)
- **12:35 12:55** Working Group formation and collaboration arrangements (Andreea)
- **12:55 13:00** Any other business? Closure of the session (AII)







## Meet & Greet

Ms. Suzan Taha, Key Water Expert, WES All participants





### Meet & Greet





Suzan Taha, WES Key Water Expert, Jordan







# Lessons learned from the training in Athens during January 16-20, 2023

All participants

Please provide an example of a lesson learned during the training that has been or will be implemented!





## What has been or will be implemented?











# Summary of the evaluation of the regional training – feedback by participants







## **Event evaluation - feedback**

#### Successful event planning



A.3. Provision of support (if requested) for participants' preparation for the event / Assistance fournie (si elle a été demandée) pour le travail préparatoire des participants pour l'évènement 32 απαντήσεις



A.4. Efficient and effective follow-up of preparations and progress towards the event / Suivi efficace de la préparation et des progrès accomplis pour la tenue de l'évènement 32 απαντήσεις













## **Event evaluation - feedback**

#### Room for improvement in event planning



DK

CONSULTANTS

LDK Consultants Global EEIG

A.2. Efficient logistics: accommodation, transportation, location of venue and interpretation/Efficacité de la logistique: hébergement, transport, lieu de la réunion et interprétation 32 απαντήσεις



A.6. Smooth flow of programme, efficient handling of emerging needs and attentiveness to participants concerns / Bon déroulement du progra...ce des besoins émergents et aide aux participants 32 απαντήσεις







### **Event evaluation - content**

#### Feedback on content

A.10. Efficient and Effective Facilitation / Modération efficace 32  $\alpha\pi\alpha\nu\tau\dot{\eta}\sigma\epsilon_{i}\varsigma$ 



A.11. Overall rating of the event / Evaluation globale de l'évènement 32 απαντήσεις









### **Event evaluation - content**

#### Room for improvement in content



B.1. Coverage of the event. In your opinion did the event cover (tick one of the following): / Couverture de l'évènement. A votre opinion l'atelier a traité (cochez une des options suivantes): 31 απαντήσεις



B.3. Length of the training. In your view the workshop duration (tick one of the following): / Durée de l'atelier de formation. A votre avis, la durée de l'atelier était (cochez une des options suivantes): 32 απαντήσεις



Longer than needed/ Trop longue Sufficient / Sufisante Shorter than required/ Trop courte B.2. Level of difficulty (tick one of the following): / Niveau de difficulté (cochez une des options suivantes): 32 απαντήσεις



Elementary / Elémentaire



## Acquired knowledge



Most valuable lessons:

- Establishment of DMAs and Pressure management
- New technology and software
- Lessons learnt from other participants / Experience exchange
- **Key Performance Indicators**
- **Development of Annual Water Balances**







## Necessary focus areas



Areas for improvement:

- Practical work and training boots on the ground (i.e., practical training on lead detection following the LLP method)
- Site visits
- Software application / training
- Shorter sessions overall, but longer training period







## Summary of identified Standard Operating Procedures (SOPs) – existing and proposed

Cor Merks







#### Identified Standard Operating Procedures (SOPs) – existing and proposed

- Calculating a water balance
- Data quality management
- Selecting relevant Key Performance Indicators (KPIs)
- Target setting (economics and strategy)
- Control of illegal service connections
- Reducing customer metering inaccuracies
- Detection of fraud
- Leak detection: Localise, Locate and Pinpoint (LLP)
- Establishment and monitoring of District Metered Areas (DMAs) incl. interpretation and usage of DMA data
- Establishment and monitoring of Pressure Managed Zones (PMZs)
- Leak repair incl. mobilisation of equipment and repair materials
- Repair or replace?
- Working in low pressure systems (eliminating intermittent supply)



## Identified SOPs – existing and proposed



## Procédures Opérationnelles Standard (POS) identifiées – existantes et proposées

- Calcul du bilan hydrique
- Gestion de la qualité des données
- Sélection des indicateurs clés de performance (ICP) pertinents
- Détermination d'objectifs (économiques et stratégiques)
- Examen des raccordements non autorisés
- Réduction des inexactitudes de comptage effectué par les clients
- Détection de fraude
- Détection de fuites: localiser, situer et repérer
- Établissement et surveillance de zones de comptage sectorisées (ZCS) incluant l'interprétation et l'utilisation des données provenant des zones de comptage sectorisées
- Établissement et surveillance de zones de gestion de la pression (ZGP)
- Réparation de fuites incluant mobilisation d'équipement et de matériaux de réparation
- Réparer ou remplacer?
- Travaillant dans les systèmes basse pression (éliminant l'approvisionnement intermittent en eau).



## Identified SOP: Calculating a water balance (1)

		Water Exported			Billed Water Exported		
Own Sources		Water Supplied	Authorized	Billed Authorized Consumption	Billed Metered Consumption	Revenue Water	
	System Input Volume Water Supplied		Cons umption		Billed Unmetered Consumption		
				Unbilled Authorized Consumption	Unbilled Metered Consumption	Non-Revenue Water (NRW)	
Water I mported					Unbilled Unmetered Consumption		
			ter Supplied	Apparent Losses	Unauthorized Consumption		
					Customer Metering Inaccuracies		
					Systematic Data Handling Errors		
		Water Losses	Real Losses	Leakage on Transmission and/or Distribution Mains Leakage and Overflows at Storage Tanks			
					Leakage on Service Connections		

- System Input Volume
  - Volume from Own Sources
  - Water Imported
- Revenue Water
  - Billed Water Exported
  - Billed Metered Authorised Consumption
  - Billed Unmetered Authorised Consumption
- Non-Revenue Water (NRW)
  - Unbilled Authorised Consumption
  - Apparent Losses
  - Real Losses
- Water Losses
  - Apparent Losses
  - Real Losses

### Identified SOP: Calculating a water balance (2)





'LEAKS' Suite of LEAKAGE EVALUATION and ASSESSMENT KNOW-HOW SOFTWARE							
CheckCalcs - a free software for identifying Leakage and Pressure Management Opportunities							
CheckCalcs	HIC & LAMIC	Version 6a	11th Apr 2014	Europe	EUR	0001	© ILMSS Ltd
THIS WOR	RKSHEET IS USED TO ENTI	ER DATA NEEDE	D FOR PERFORMAN	ICE AND PRESSURE MANAG	EMENT OPPO	RTUNITIES CA	LCULATIONS
Data entry	Essential data entry	Default Values	Fro	m another V	/orksheet		
STEP 1: Enter WATER UTILITY and SYSTEM NAME, and basic information on SYSTEM PRESSURE							
Country	Europe	Utility	Cor Merks		01-01-2002	to	01-01-2003
System	Anytown		Is supply in	put mainly by Gravity (C	G) or Pumpin	g (P)?	G
% of time sy	stem is pressurised =	100,0%	Estimated a	verage pressure =	50	,0	metres
STEP 2: Enter basic information on INFRASTRUCTURE for this system							
	Length of Transm	ission and Dis	tribution Mains (L	Lm)	750,0		km
	Number of service co	onnections, m	ain to property lin	ie (Ns)	52000		
Length of priv	vate pipes Lp, from pro	ustomer meters	Average Lp	3,0		metres/Ns	
(or from prop	erty line to first point o service conne	n for unmetered	Total Lp	156,0		km	
	Number of service	er kilometre of m	nains	69,3		per km	
Do properties	s have storage tanks?	Np	Number of Bi	illed Properties (Np)	53000		Ns/Np =0,981
	When you have o	completed this	Worksheet, mov	e on to the 'Water Bala	nce' Worksh	eet >>>>	
				Infrastructure	Repairs	Frequency	Units
Meter Location on Service Connections				Mains*	75	10,0	per 100 km/year
Titalization Main				Services** main to meter	300	5,8	per 1000 conn/year
* excluding hydrant repairs ** excluding small le						small leaks at	meter and stop tap
Case Is Materia to a creary close to the property Line   Property Line				Comments on data ent	tered in this \	Worksheet:	
	1						
Customer Meter	Case 2: m metres af w erage Ns	etern are located L p ter the property line, m	on				



## Identified SOP: Data quality management

	Volume (V) [m³/d]	95% Confidence Interval (CI)		Standard Deviation (SD) [=V x CI /1.96]	Variance (Va) [= SD^2]	
System Input Volume	300,000			3,061	9,369,721 +	
Billed Author. Consumption	200,000	+/- 0 %		0	0	
Non-Revenue Water	100,000	+/- 6 %	-	3,061	 9,369,721 +	
Unbilled Author. Consumption	5,000	+/- 50 %		1,275	 1,626,926	
Water Losses	95,000	+/- 7 %	-	3,316	 10,996,647 +	
Apparent Losses	20,000	+/- 30 %		3,061	9,371,095	
Real Losses	75,000	+/- 12%		4,513	 20,367,742	

Funded by the European Union



## Identified SOP: Selecting relevant KPIs

	GOOD PRACTICE PERFORMANCE INDICATOR FOR LEAKAGE, FIT FOR PURPOSE							
OBJECTIVE	Volume per year	litres/ service connection	m <sup>3</sup> /km mains	litres/ billed property	% of System Input Volume	% of Water Supplied	Infrastructure Leakage Index, with Pressure	
SET TARGETS AND TRACK PERFORM ANCE, FOR AN INDIVIDUAL SYSTEM	YES, for large systems	YES*	YES*	YES (UK)	NO	NO	Only if all justifiable pressure management completed	
TECHNICAL PERFORMANCE COMPARISONS OF DIFFERENT SYSTEM S	NO	NO	NO	NO	NO	NO	YES	
DRAW GENERAL CONCLUSIONS FROM SINGLE OR MULTIPLE SYSTEMS	NO	NO	NO	NO	NO	NO	YES, together with other context factors	

\* Choose services connection density > 20/km; if not, choose mains; or base choice on country custom and practice

## Identified SOP: Setting economic and strategic targets (1)

- 1. Objectives
- 2. Strategies
- 3. Critical success factors (constraints and the context)
- 4. Performance Indicators (PIs)









## Identified SOP: Control of illegal connections Identified SOP: Detection of fraud

- Apparent (or: commercial) losses are generally due to lack of appropriate procedures or nonapplication of the procedures
- Unregistered consumer or unregistered consumption of registered customers?
  - Illegal service connections
  - Different types of illegal consumption (frauds)
- Examples of frauds:
  - Illegal use of public equipment
  - Additional connections
  - Disconnected connections (in use)
  - By-passed meter
  - Tampered meters







## Identified SOP: Reducing customer metering inaccuracies

- Revenue Water
  - Billed Water Exported
  - Billed Metered Authorised Consumption
- Customer meter accuracy will depend on many factors
- Meter management is a crucial activity of a water operator (refer to the presentation of EYDAP)



- EU Measurements Instruments Directive (MID)
- NL Self Regulation based on Regulation Quality Control Water Meters (RQW) – latest version 2009
  - Water meters are divided into groups (populations) of same technique, material and capacity
  - Statistical method to follow front lifetime expectancy of each group, based on sample testing



## Identified SOP: Active Leak Detection (ALD) - Localise, Locate, and Pinpoint

#### <u>Localise</u>

- District Metered Areas (DMAs)
  - Help identifying where to survey
  - Small DMA, better localization
  - Permanently installed noise loggers?
- Step testing
- All fittings survey
- Noise loggers
  - Getting better
  - Functions to dismiss false positives
  - Acoustic footprints only or auto correlate
  - Mapping into Google Maps
  - Only record noise
- Satellite leak detection

#### <u>Locate</u>

- Correlator
- Accelerometer and hydrophones
- Tracer gas method
- Free-swimming ALD tools
- Thermal imaging sensor (drone)
- Infrared sensors on a vehicle
- Cameras/cables in water pipe



#### <u>Pinpoint</u>

- Listening device
  - Ground microphones
  - Listening stick (conventional or electronic)

Confirmation of the exact location of a leak by listening on the surface; to accurately target the excavation



## Identified SOP: Establishment and monitoring of DMAs incl. interpretation and usage of DMA data (1)

- A DMA is a hydraulically discrete area within a zone of the water distribution network
- Used for monitoring flow and pressure; used for prioritizing Active Leak Detection activities



## Identified SOP: Establishment and monitoring of DMAs incl. interpretation and usage of DMA data (2)

#### Before DMAs:

- Flow can only be measured at the water treatment plant and at zone boundaries
- Insufficient hydraulic knowledge of the water distribution network
- Limited ability to prioritize
- Active Leakage Control is passive
- No feedback on results of Active Leak Detection activities

- Flow and pressure logged at DMA meters
- DMA flows can be analyzed to target DMAs with high leakage
- ALD activities are only done in DMAs with high leakage => Active Leakage Control is active





## Identified SOP: Establishment and monitoring of DMAs incl. interpretation and usage of DMA data (3)



### Identified SOP: Establishment and monitoring of PMZs





## Identified SOP: Leak repair incl. mobilisation of equipment and repair materials (1)





- Left: rural area burst
- Middle: urban area burst
- Right: urban area burst with damage



### Identified SOP: Leak repair (2)



HANDBOEK MATERIALEN DISTRIBUTIE ontwerp en materialen sap nummers INTERN

REPARATIEBEUGEL LOODVERBINDINGEN

1000000619 REP. BEUGEL VOOR LOODVERB 80 1000000613 REP. BEUGEL VOOR LOODVERB 100 1000000614 REP. BEUGEL VOOR LOODVERB 125 1000000615 REP. BEUGEL VOOR LOODVERB 150 1000000616 REP. BEUGEL VOOR LOODVERB 200 1000000617 REP. BEUGEL VOOR LOODVERB 250 1000000618 REP. BEUGEL VOOR LOODVERB 300



#### REPARATIEKLEMMEN RVS

Roestvrii stalen reparatieklemmen. Toepassen bij reparatie van leidingen Voor toe te passen type zie werkboek. FS 10 is een eendelige beugel.

1000000360 REP. KLEM RVS FS 10 60- 67 X 150 1000000361 REP. KLEM RVS FS 10 66-76 X 150 1000000851 REP. KLEM RVS FS 10 73-80 X 200 1000000865 REP. KLEM RVS FS 10 82-89 X 200



1000000852 REP. KLEM RVS FS 20 88- 110 x 200 1000000853 REP, KLEM RVS ES 20 114-136 x 200 1000000854 REP. KLEM RVS FS 20 130- 152 x 200 1000000855 REP. KLEM RVS FS 20 152- 174 x 200 1000000856 REP. KLEM RVS FS 20 174-196 x 200 1000000857 REP. KLEM RVS FS 20 196- 218 x 200 1000003703 REP. KLEM RVS FS 20 210- 230 x 200 1000003704 REP. KLEM RVS FS 20 230- 250 x 200



1000003705 REP. KLEM RVS FS 20 108- 130 X 300 1000003706 REP. KLEM RVS FS 20 130-152 X 300 1000003707 REP. KLEM RVS FS 20 152-174 X 300 1000003708 REP. KLEM RVS FS 20 174-196 X 300 1000003709 REP, KLEM RVS FS 20 196-218 X 300 1000003710 REP. KLEM RVS FS 20 210- 230 x 300 1000003711 REP. KLEM RVS FS 20 230- 250 x 300

#### **REPARATIEKLEMMEN KIST 213-781 MM**

Roestvrij stalen reparatiesegmenten. Toepassen vanaf diameter 213 mm tot 781 mm. Losse segmenten in een kist. Aantal en soort per diameter volgens werkboek of de lijst in de kist.

1000000858 REP. KLEM RVS KISTSEGMENT NO. 1 BREEDTE 300 1000000859 REP. KLEM RVS KISTSEGMENT NO. 2 BREEDTE 300 1000000860 REP. KLEM RVS KISTSEGMENT NO. 3 BREEDTE 300 1000000861 REP. KLEM RVS KISTSEGMENT NO. 4 BREEDTE 300 1000000862 REP. KLEM RVS KISTSEGMENT NO. 5 BREEDTE 300



Funded by Ramboll the European Union LDK Consultants Global EEI vironment Support HANDBOEK MATERIALEN DISTRIBUTIE (ontwerp en materialen)

Rini Wenting, Gerard Bijeman en Piet Hammink

Versie datum 10-08-2021

Schriifrechten:

.

Status

## Identified SOP: Repair or replace?



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OVERVIEW

TABLE OF CONTENTS

ABOUT THE AUTHOR

#### Water Management and Water Loss

Water Management and Water Loss contains a selection of papers and articles written by various internationally recognised specialists in the field of water loss reduction. The articles have been drawn together from IWA conferences during the past 5 years and provide details of how water losses from Municipal distribution systems can be reduced. The book provides useful background information and reference materials to help explain the different approaches and interventions that are used to reduce water losses. Numerous real case studies are provided that highlight the processes and methodologies employed around the world to reduce water losses



Introduction, Leak detection technologies, Principles of pressure management, The repair or replace dilemma, Jo Parker; Community awareness and education, Meter logging and recording, Large consumer meter consolidation and improvements: Planning, implementation and benefits, Software tools to assist with water loss reduction in municipal systems, International case studies from around the world, Application in water loss reduction project in Bosnia and Herzegovina, Devad Koldžo and Branko Vuc<sup>\*</sup>ijak; Large scale water loss management improvement programme in Zagreb (Croatia) water distribution network, Kristijan Ilic<sup>\*</sup> ic', Jurica Kovac', Vlado Herceg, Berislav Bohatka, Mario Medven and Ivan Grdenic; Analysis of the water losses from the aspect of central water meters in objects of collective housing, Bajc<sup>\*</sup>i Angela and Radovanov Milenko; Water loss management in Novi Sad water utility, Serbia, Zlatko Arvaji and Ikonija Karadžic'; Continuous acoustic monitoring – evolution of an innovation in the USA, David Hughes; Establishing the first validated dataset of North American water utility water audit data, A. Chastain-Howley, G. Kunkel and W. Jernigan

Water Management and Water Loss covers many aspects of water loss control including, pressure management, leak detection and repair, Internal plumbing losses and retrofitting, community involvement and education/awareness, schools education and leak repair projects.

Authors: Stuart Hamilton, Hydrotec Ltd., Thorpe Underwood, Northants, UK and Ronnie McKenzie, Groenkloof, Pretoria, South Africa

Also available as part of your Water Inteligence Online subscription

Publication Date: 15/10/2014 ISBN13: 9781780406350 eISBN: 9781780406367 Pages: 250

Print: Standard price: £108 / €135 / \$162 Member price: £81 / €101 / \$122

eBook: Standard price: £108 / €135 / \$162 Member price: £81 / €101 / \$122

Water and Rambol

Environment Support

• Great opportunity to update excellent work by Jo Parker on "the repair or replace dilemma"

- Extended and increased experience on GIS, hydraulic modelling, etc.
- Novel software tools for Likelihood of Failure (LoF) and Consequence of Failure (CoF) calculations

## Identified SOP: Working in low pressure systems to eliminating intermittent supply

Search	This Journa 🗸 🔍 Advanced Search	Cart 📜 Register Sign In 🗸					
AQUA Water Infrastructure, Ecosystems and Society	6						
ISSUES JOURNAL INFORMATION $\lor$ LIBRARIANS $\lor$ BOOKS $\lor$ About $\lor$	G Select Language						
AQUA: Water Infrastructure, Ecosystems, and Society Special Issue on: Intermittent Water Supply: Challenges, Opportunities and Solutions							
Intermittent Water Supply is common in the majority of countries in South Asia, Latin America, Africa and the Middle East. There are different factors that cause intermittency in water systems such as natural, technical and financial scarcity as well as user behaviour and institutional aspects. Intermittent access to water can have consequences on public health and social equity. Intermittent Water Supply systems are considered as failing systems that in long-term are not sustainable. A lot of work has been done by researchers and practitioners to better understand these systems, to improve their operation and management, and eventually their conversion to continuous water supply systems.							
This Special Issue presents a collection of high-quality, peer-reviewed technical papers Authors contribute to highlighting the importance of these topics and providing innov- Issue is an important contribution to the ongoing efforts to address the challenges of I	that address the challenges, opportunities, and solutions of IWS systems. ative solutions to the challenges facing IWS systems. Overall, this Special WS systems, and the papers within it provide valuable insights for						

researchers and practitioners.

#### **Guest Editors**

Raziyeh Farmani, Associate Professor, Centre for Water Systems, University of Exeter, Exeter, UK

Bambos Charalambous, Hydrocontrol Ltd, Limassol, Cyprus

Kara Nelson, Professor, Civil and Environmental Engineering, University of California, Berkley, USA

Joe Dalton, HydrOptimise, Bahrain



# Selection of maximum two (2) SOPs to be developed – using Mentimeter

Andreea Florea & Cor Merks

All participants





M Mentimeter

Join at menti.com use code 3899 0708

## Instructions

## Go to www.menti.com

Enter the code

## 3899 0708



Or use QR code



# Working Group formation and collaboration arrangements

Andreea Florea & Cor Merks

All participants







## WGs and collaboration arrangements

- One WG per SOP to be developed
- Ramboll processes all available information into a draft SOP (i.e., information forwarded, IWA WLSG info, etc.)
- Draft SOP will be forwarded (timely) for review
- One virtual review meeting sometime in September 2023

- WG member forwards available information to Ramboll (i.e., existing procedures, work method descriptions, etc.)
- WG member coordinates review in own organisation/country
- WG member provides comments and suggestions for improvement





## Group formation





- WG will be established based on the topic of interest
- Please state your SOP preference







## Any other business? Closure of the session

All participants Ms. Suzan Taha





## Any other business?











Water and Environment Support in the ENI Southern Neighbourhood region

## Looking forward seeing you soon again! Thank you for your attention and enthusiasm