

Water mains rehabilitation from an Asset Management perspective

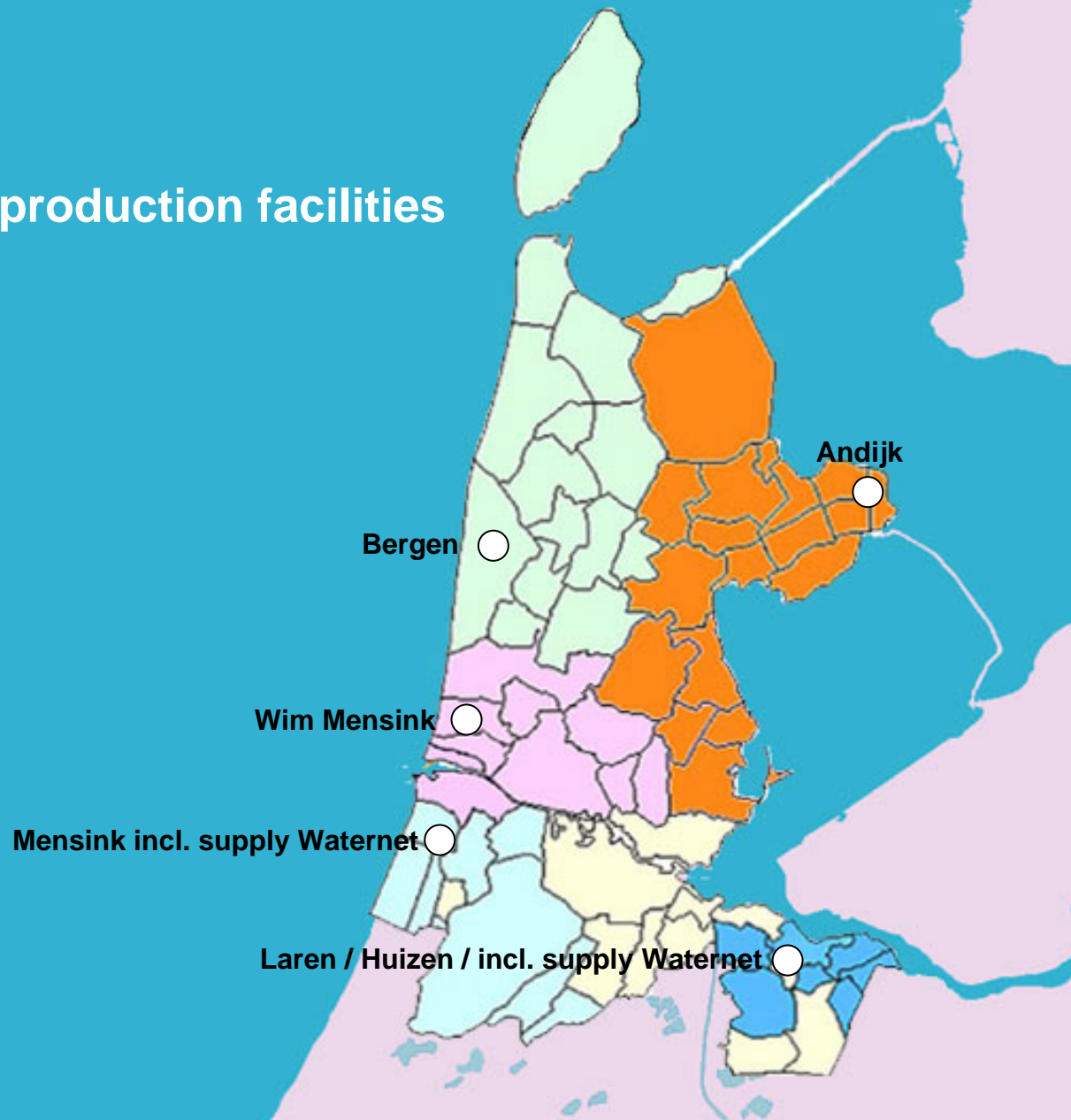
Loet Rosenthal

Rehabilitation of drinking water pipelines
Enkhuizen, November 26th 2007

PWN Water Company North-Holland



Supply areas and water production facilities



Primary water mains

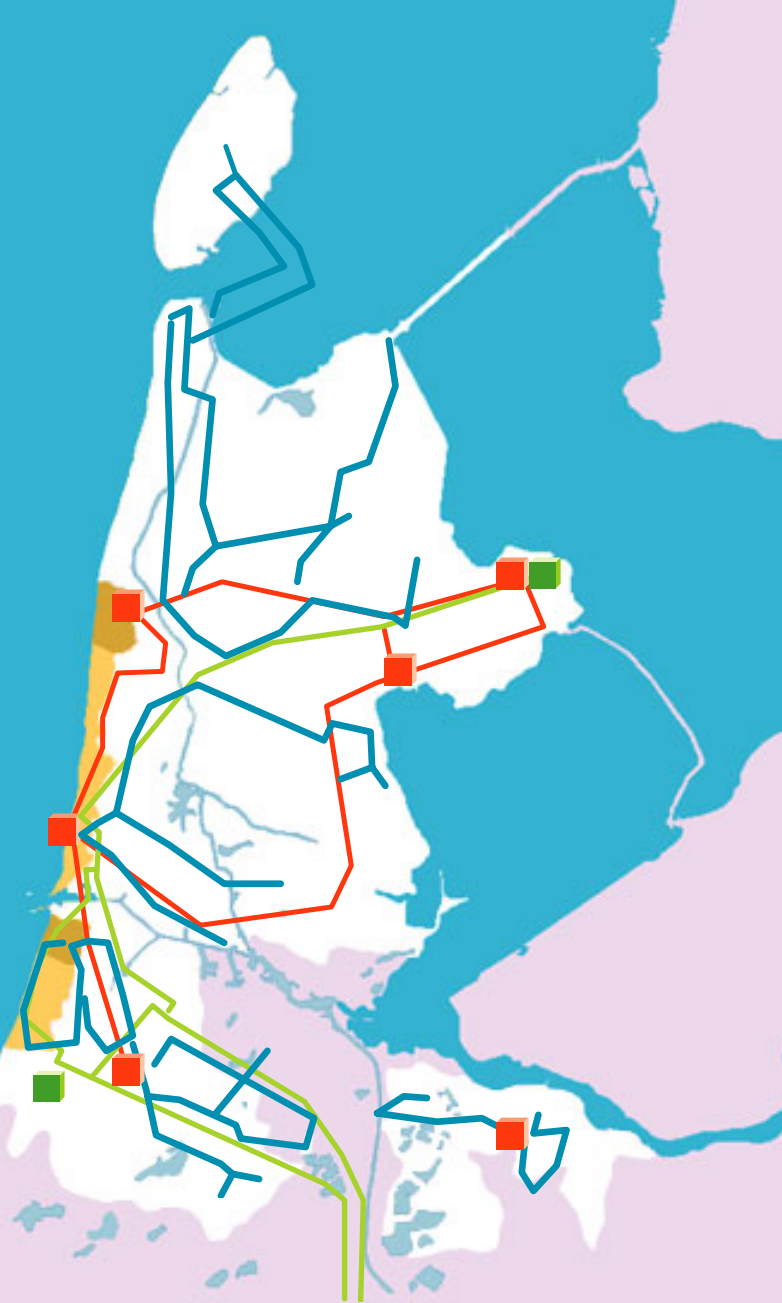
■ Drinking water (ring, supply continuity)

■ Pretreated water

■ Drinking water

Total system length: 10.000 kilometer

No. of connections: 720.000



Asset Management at PWN

- Meeting performance criteria at minimum life cycle cost
- Performance criteria
 - Substandard supply
 - No water or low pressure supply (planned and unplanned)
 - Water quality
 - Complaints
 - Water quality and pressure
- Knowing our 'performance killers'

Why focus on water mains renewal?

- Pipe breaks and leakages are possible performance killers
 - Disruption of supply
 - Repair and damage costs
 - 'Social damage'
 - Traffic interruptions
 - Public perception of PWN









No.1 performance killer 2007



What are the renewal options?

- Pipe replacement (traditional)
 - Costly
 - Socially disruptive
- Trenchless pipe replacement
 - E.g. pipe cracking
- Trenchless pipe rehabilitation
 - Pipe-in-pipe, lining techniques

Trenchless is the future





Case 'Streekleiding'

- Ø 900 mm concrete water main constructed in 1991/1992
 - Length: about 4 km
- Important water main in terms of supply reliability

‘Streekleiding’: concerns

- Various leakages on pipe joints in the first years
 - 1992 (3), 1994 (2), 1997, 1998, 2000
- Serious concern about reliability
 - Confirmed in first internal inspection in 1993
 - Leakages due to joint-openings and/or joint rotation exceeding standards
 - This applied to 80 joints
 - 4 joints were instantly repaired, 17 later in 1993
- Major cause is ineffective pipe foundation
 - Soil characteristics (clay)
 - Excessive rainfall during construction
 - Construction quality
- As a result internal pipe pressure was limited to 5 bar

‘Streekleiding’: new concerns

- Future supply scenarios ask for a more reliable pipe
- New partial internal inspection confirms:
 - Streekleiding is not yet ‘at rest’
 - Of 96 inspected pipe joints 40 had moved 10 mm or more since 1993
 - 21 pipe joints exceeded standards
- Conclusion: this pipe is not reliable with regard to future demand

‘Streekleiding’: options

- Internal pipe joint repairs
 - Dismissed because of life expectancy and inability for plug cleaning
- (Partial) replacement
 - Dismissed because of cost
- Lining
 - ... but which technique?

Question for BAM Nelis Infra

- We need an 'as new' water main with the following characteristics:
 - An internal diameter of at least 840 mm
 - Capable of dealing with an internal water pressure up to 6,5 bar
 - A 10 year guarantee on pipe reliability

The answer

- A close-fit lining: the “Subline”-technique
- Other lining techniques have been considered
 - Conventional HDPE-lining (pipe-in-pipe): dismissed because of internal diameter constraint
 - Other lining techniques are either not structural or are not yet approved of in the Netherlands

Conclusion from a utility AM perspective

Ask yourself two major questions

1. What is the problem to be solved?
 - Pipe integrity: structural lining
 - Is it the pipe or only the pipe joints?
 - Pipe integrity (local): various repair techniques
 - Water quality: non-structural lining
 - Cement lining / resin lining
 - Will prevent interaction between water quality and pipe material
2. What are the constraints?
 - Pipe diameter, strength, local circumstances

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