

Improving water utility's performance in Lahan (NWSC Branch)



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Presentation Outline



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Introduction to NWSC Lahan

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Progress on Key outcomes –
Water Security and Safe Clean
Water

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Status of Key Performance
Indicators (KPIs)

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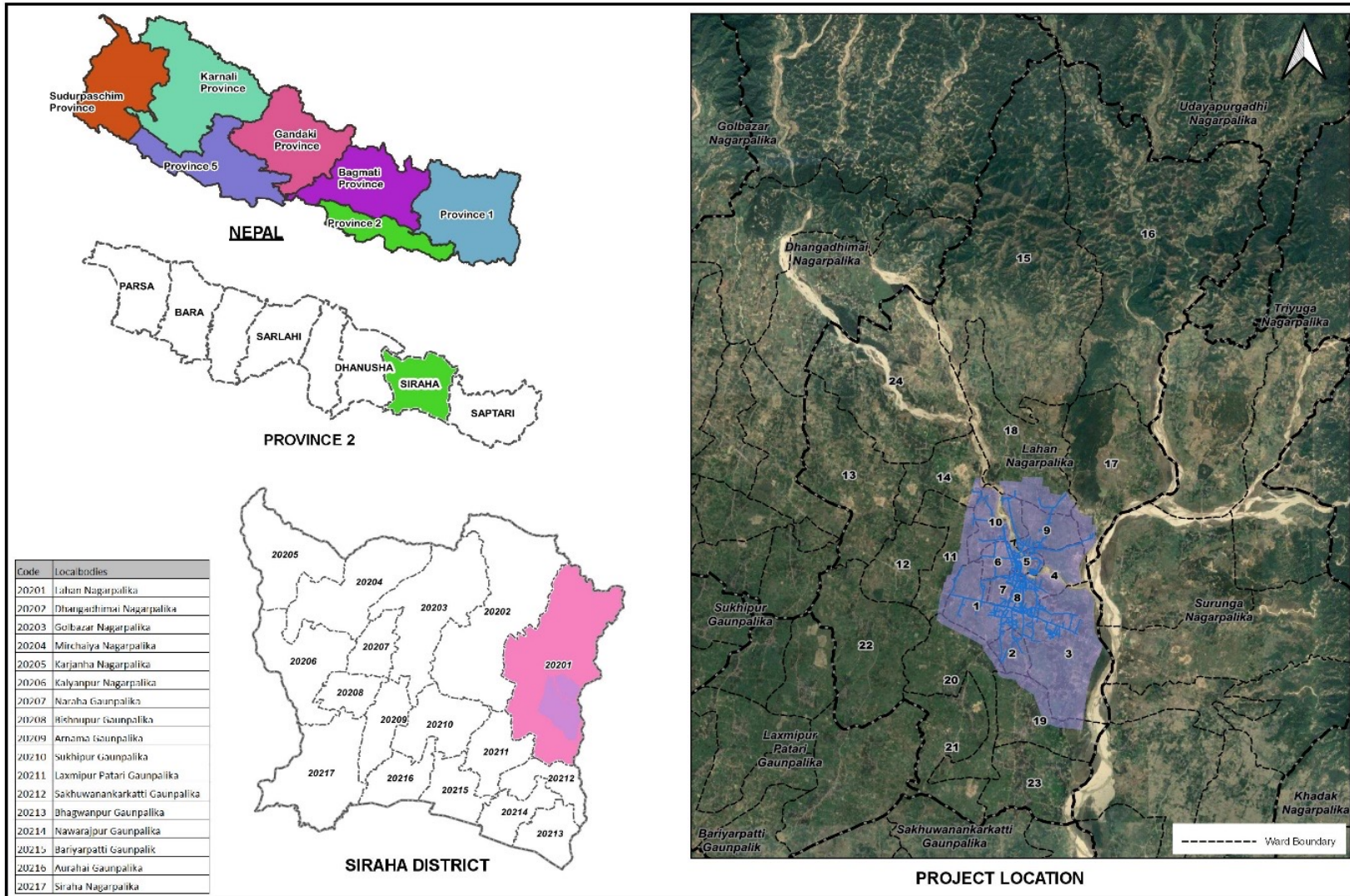
Effort and way forwards on
NRW reduction



नेपाल खानेपानी संस्थान
Nepal Water Supply Corporation



Introduction to NWSC Lahan



NWSC Lahan – Key Features

1. Service area – Ward 1 to 10 out of 24 wards
2. Geographic area coverage – 20.21 Sq. Km.
3. Total Household coverage – 4254 out of 7798 (55%)
4. Total Population coverage – 21,100
5. No. of boreholes – 10
6. No. of 450 cum water tower – 2
7. No. of 550 cum sedimentation tank – 1
8. No. of chlorine dosing unit – 5
9. Total pipeline network – 93 Km.
10. No. of Water Quality Lab - 1

Progress on Key outcomes – Water Security (Source – Boreholes)



Challenges

High ingress of fine sand into boreholes & bacteriological contamination

⇒ short asset life, poor water quality, and inability to meet demand

⇒ No proper decommissioning of abandon borehole (Contamination pathway)



Key improvements

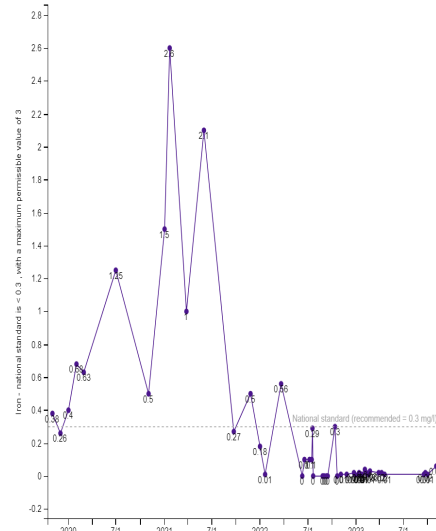
- Proper siting - Geo physical surveys
- New specification for borehole drilling/ construction
- Support with procurement process
- Hired a hydrogeologist for supervision
- CCTV camera for borehole surveys
- Training for all branch managers
- Increase Production along with stand by boreholes

Progress on Key outcomes –(Safe, clean water): Water Quality and Treatment



Challenges

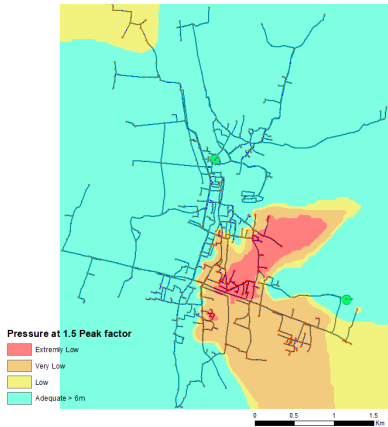
- No water quality testing labs nearby
- Irregular monitoring of water quality, mainly limited to water quality at source
- Chlorine dosing poorly controlled (batch dosing into sedimentation tank)



Key improvements

- Training on Water Safety Plans
- Sampling taps installed at major assets
- Borehole decommissioning
- Water quality lab established in Lahan
- Inline chlorine dosing
- Water quality sampling at customer taps
- Protocols for follow-up on WQ results
- Training on hygienic working practices

Progress on Key outcomes –(Safe, clean water): Network management and Tap connections



Challenges

- Very limited data on existing piped network
- No hydraulic modelling to guide network expansion
- High rate of leakage in the network
- Limited capacity to identify & repair leaks



Key improvements

- Drone survey => detailed GIS map, Network modelling
- Division of network into DMAs and DZs
- Electromagnetic flow meters for monitoring supply and demand and NRW
- Pressure improvements
- Academic research on intermittent water supply
- Training & equipment for leakage detection & Repair
- Network extension to Dalit communities in collaboration with Municipality
- Customer complain & feedback mechanism

Setting Key Performance Indicators (KPIs)

Water Supply

Water Coverage

Supply Hours

Population with access to 24 hrs supply

Non-Revenue Water (NRW)

Service interruptions

Continuous break days

Discharge

Asset Condition

Pipe leakages

Water Quality

Water Safety Planning

Health & safety

Accident frequency Rate

Customer Satisfaction

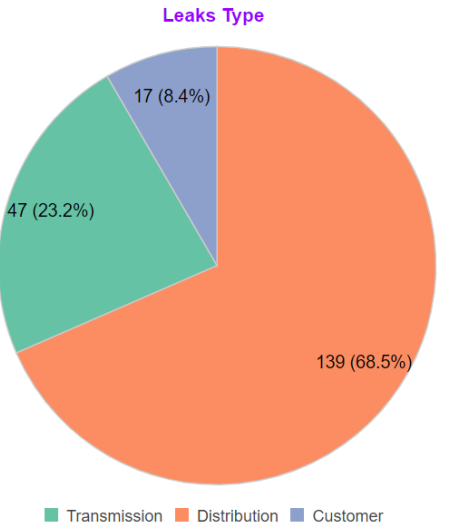
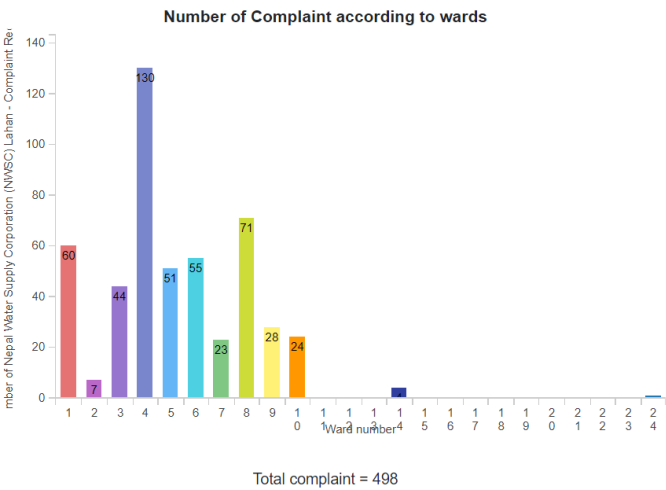
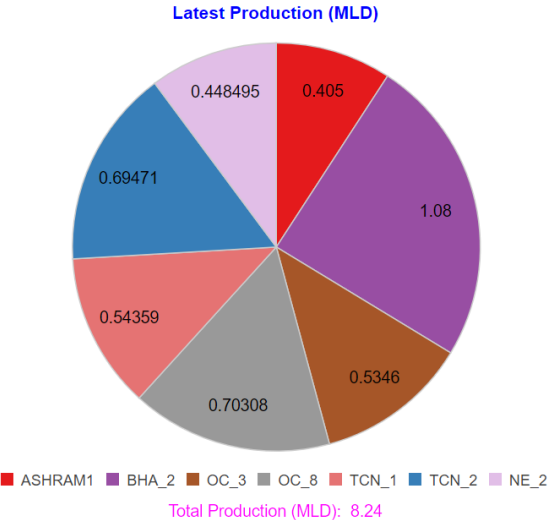
Users Satisfied

Complaints Received

Meters & Billings

Metered Ratio

Tariff Collection Ratio



Status of Key Performance Indicators (KPIs)

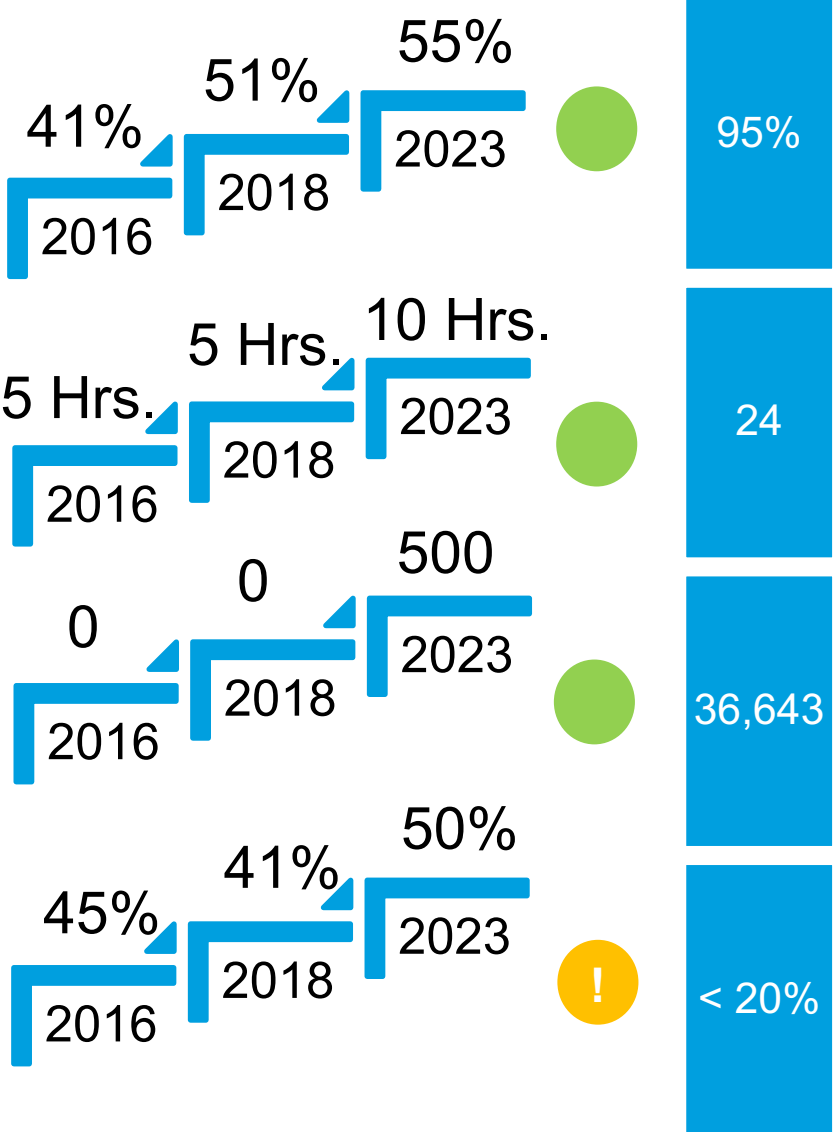
Water Supply

Water coverage

Supply hours

Population with access to 24-hour supply

Non-Revenue Water (NRW)



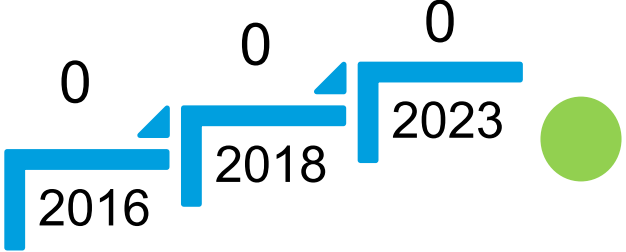
Target



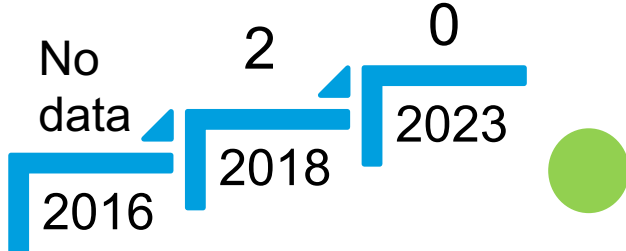
Status of Key Performance Indicators (KPIs)

Water Supply

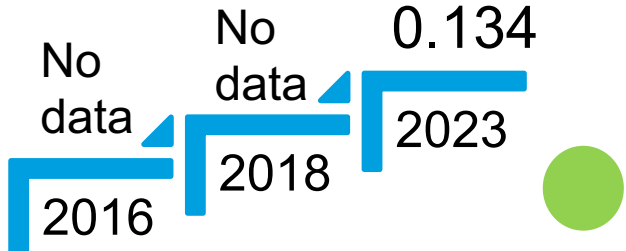
Service interruptions
(Numbers/Year)



Continuous break days
(Days/Year)



Discharge
(lps)



0

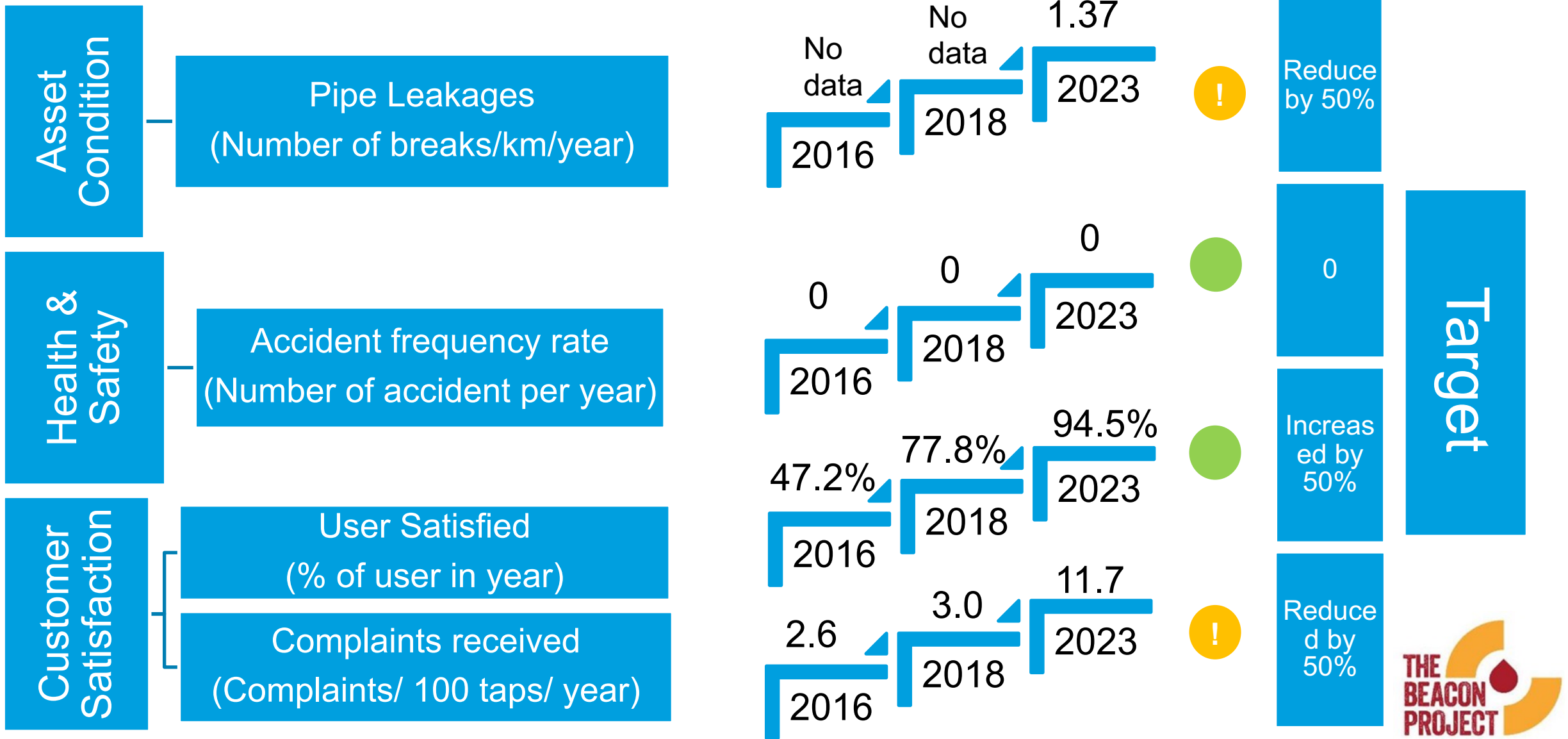
0

> 0.1

Target



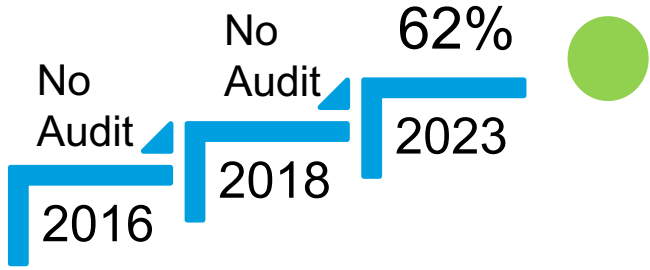
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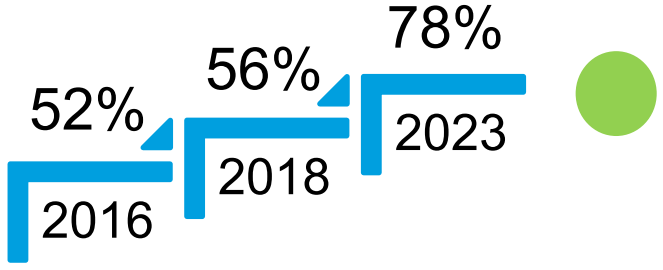
Water Quality

Water Safety Planning
(% Compliance with Water Safety Plan)

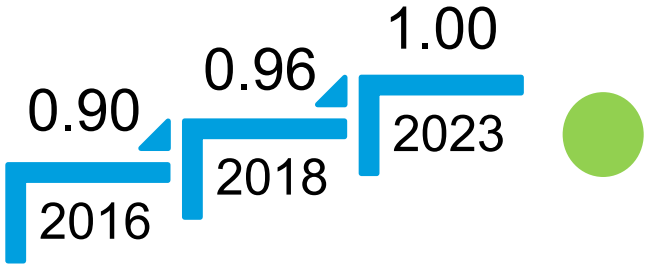


Meters & billing

Metered Ratio
(% of operating meter)



Tariff Collection Ratio
(Annual tariff collection/ Annual billing)



100%

100%

1

Target



Effort and way forwards on NRW reduction

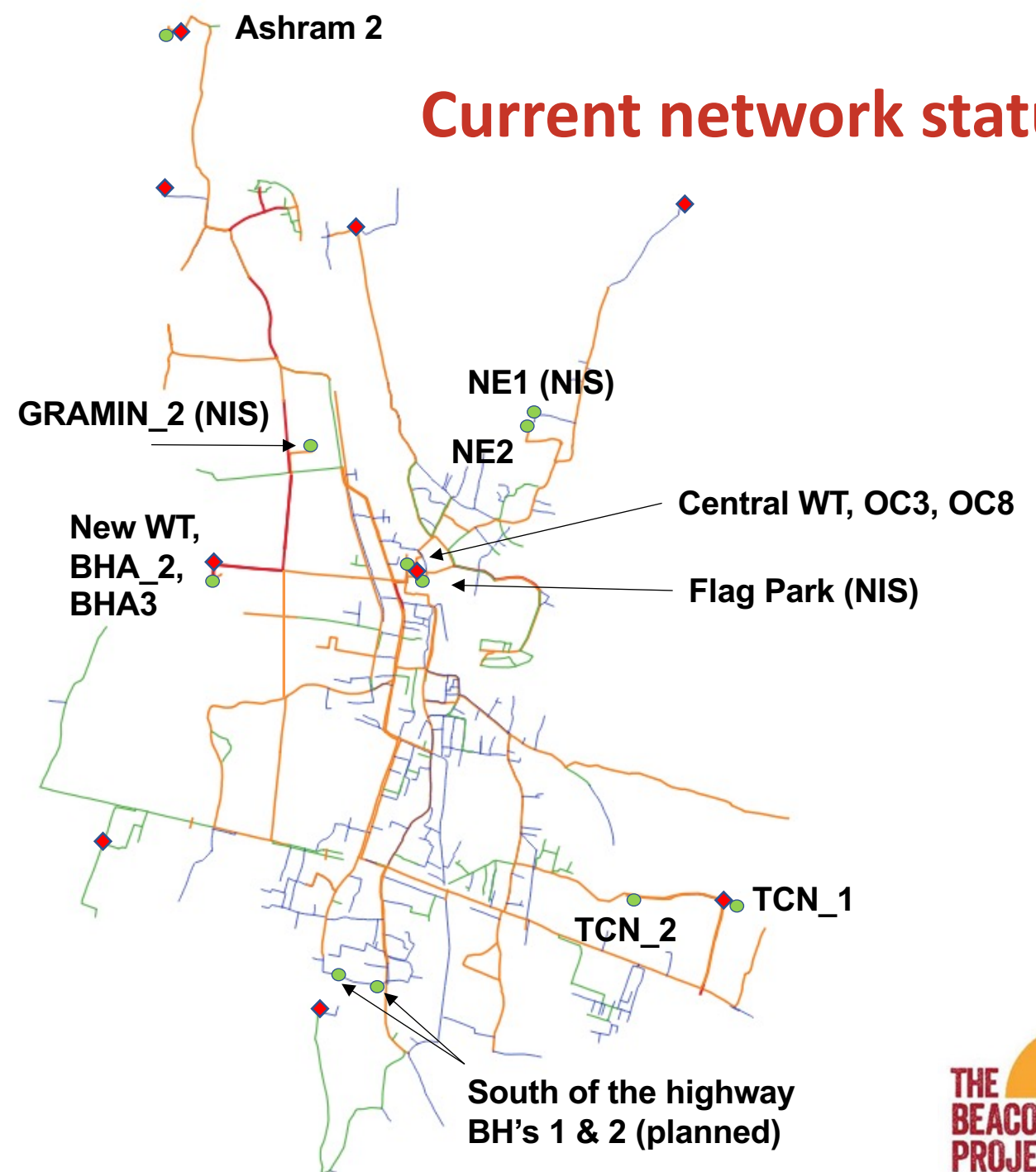
- 4 BHs developed this year
- 2 BHs planned for 2023/24
- 4.9km of mains laid in 2023
- Sedimentation bypass and WT bypass constructed
- Sedimentation tank cleaned
- 12 pressure logger locations tapped
- Chlorine dosing on each input

Mains Diameter (“)

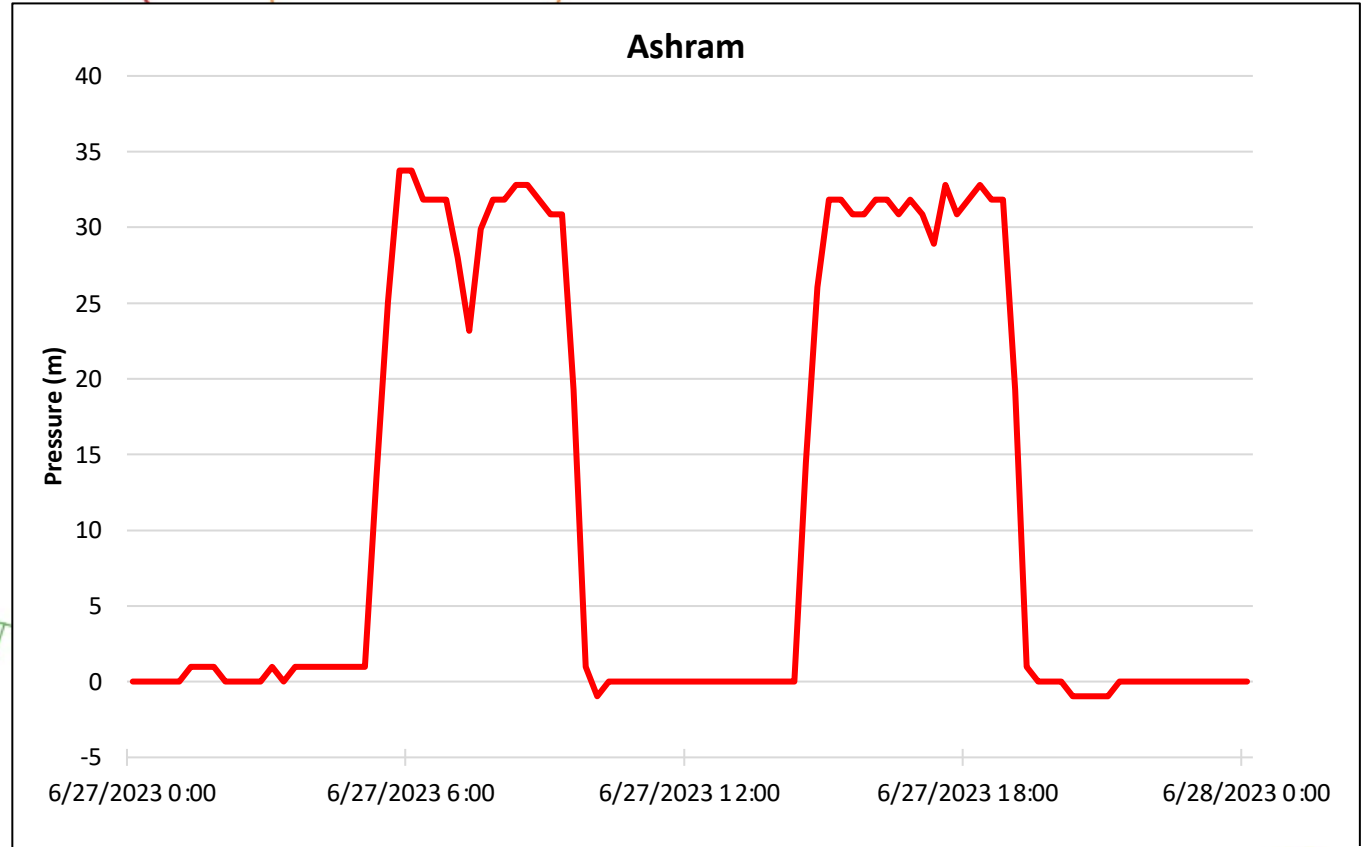
- 0.0 - 0.9
- 0.9 - 2.9
- 2.9 - 3.9
- 3.9 - 7.9
- 7.9 - 10

- Operational site / BH
- ◆ Pressure logger Location

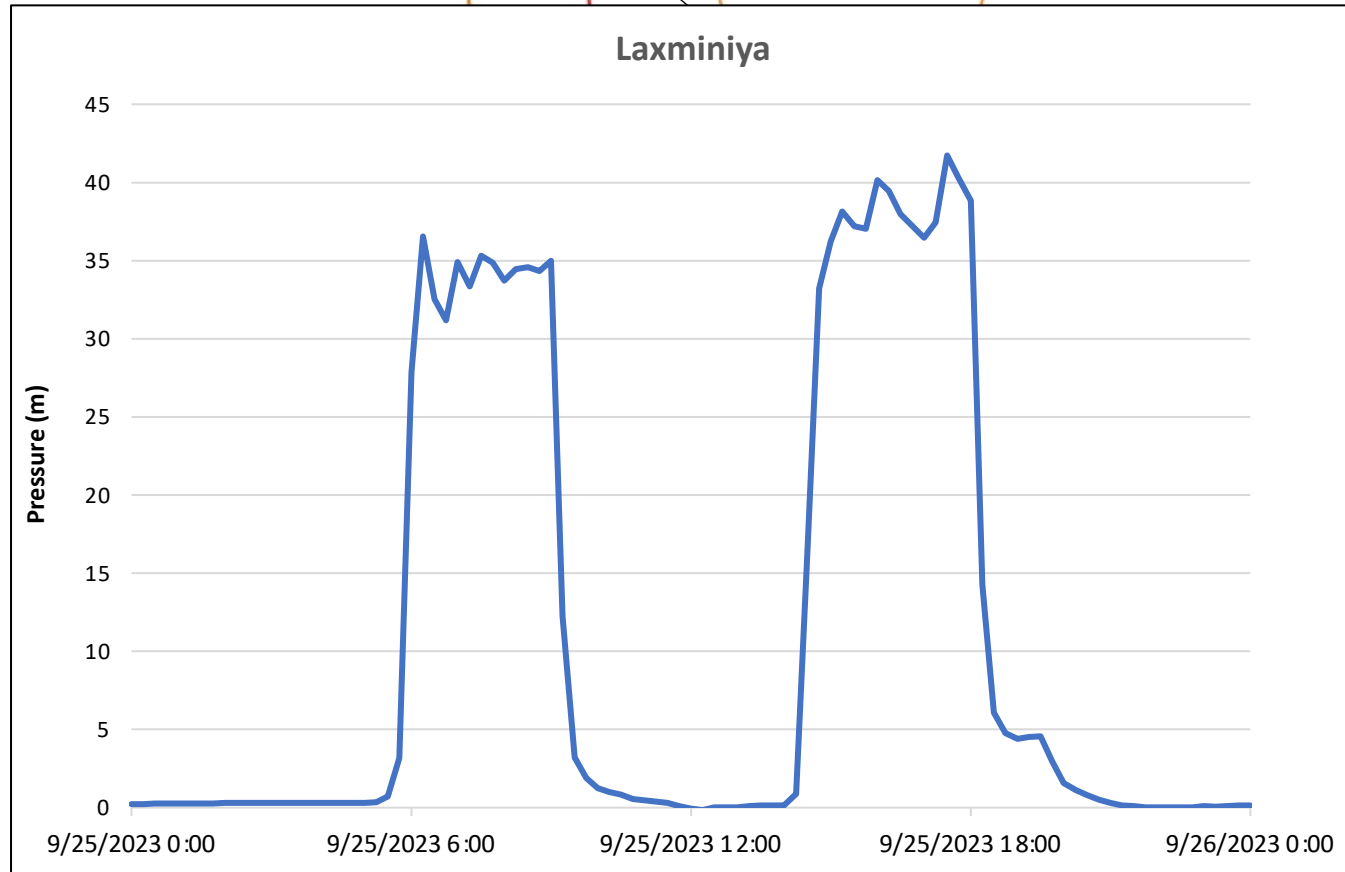
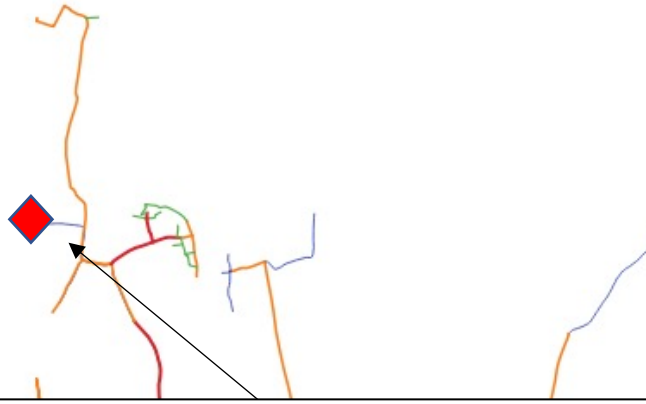
Current network status



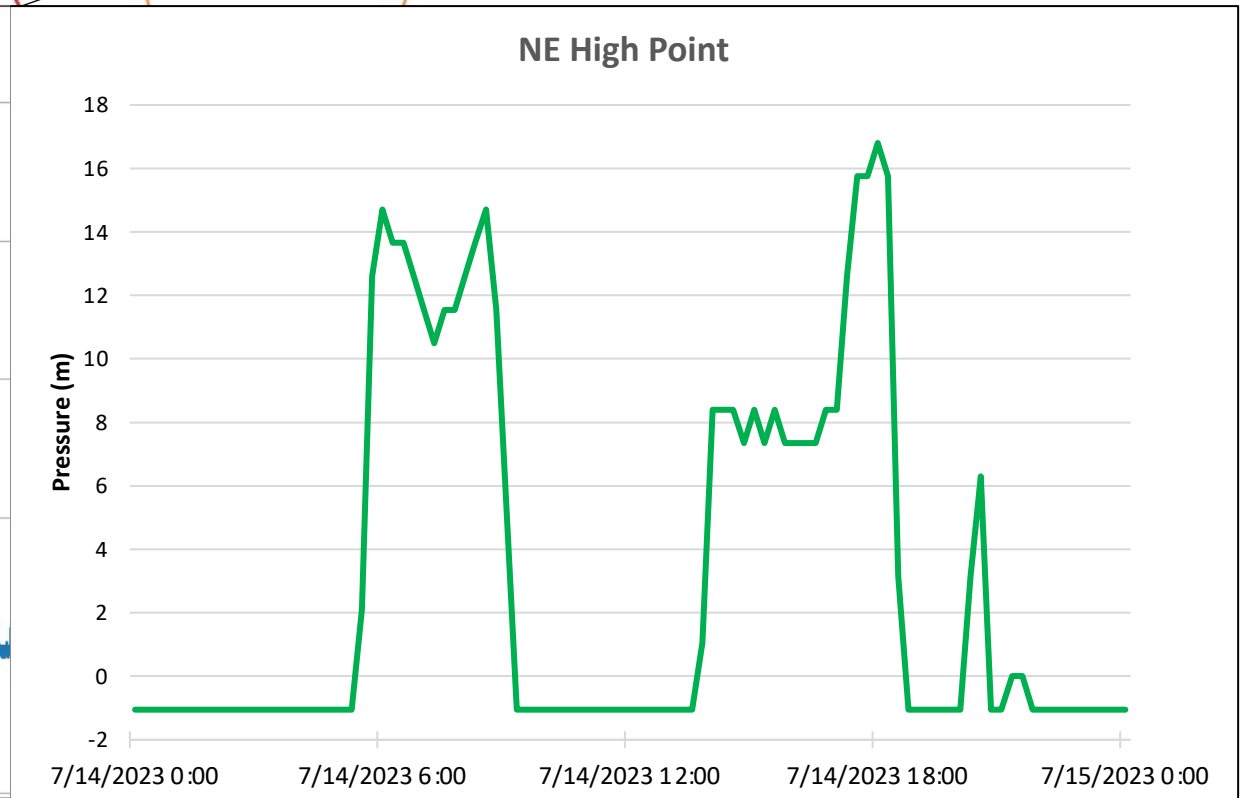
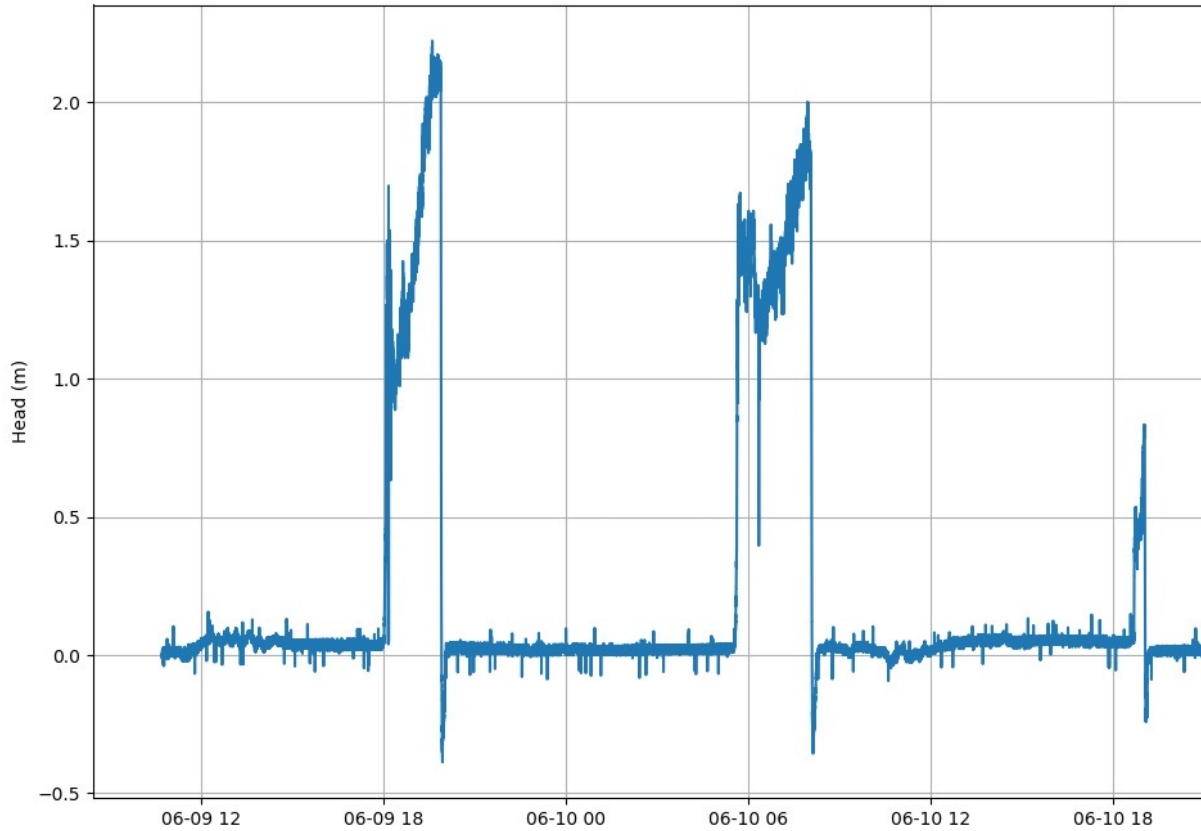
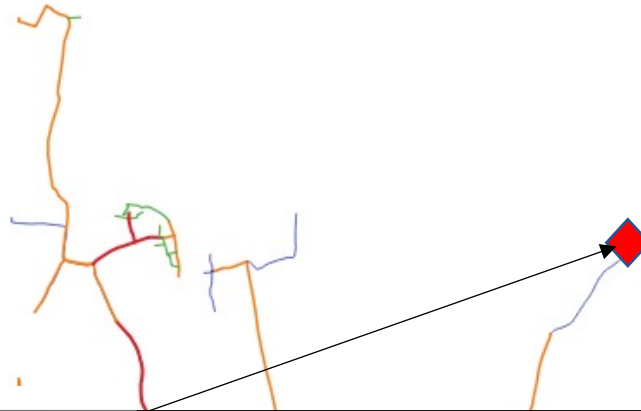
Pressure data: Ashram



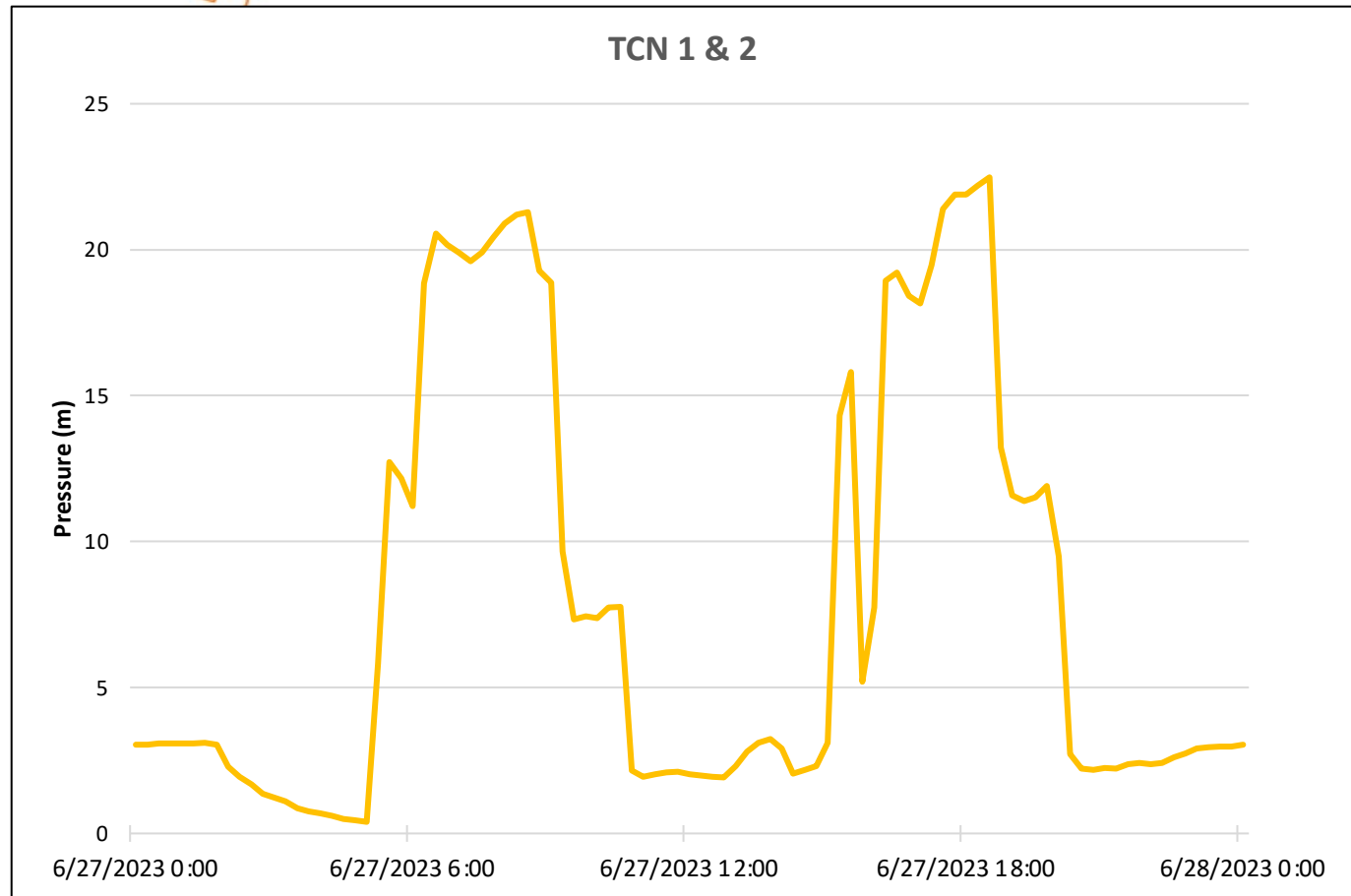
Pressure data: Laxminiya



Pressure data: North East



Pressure data: TCN



DZ Original Design

Mains Diameter (")

0.0 - 0.9

0.9 - 2.9

2.9 - 3.9

3.9 - 7.9

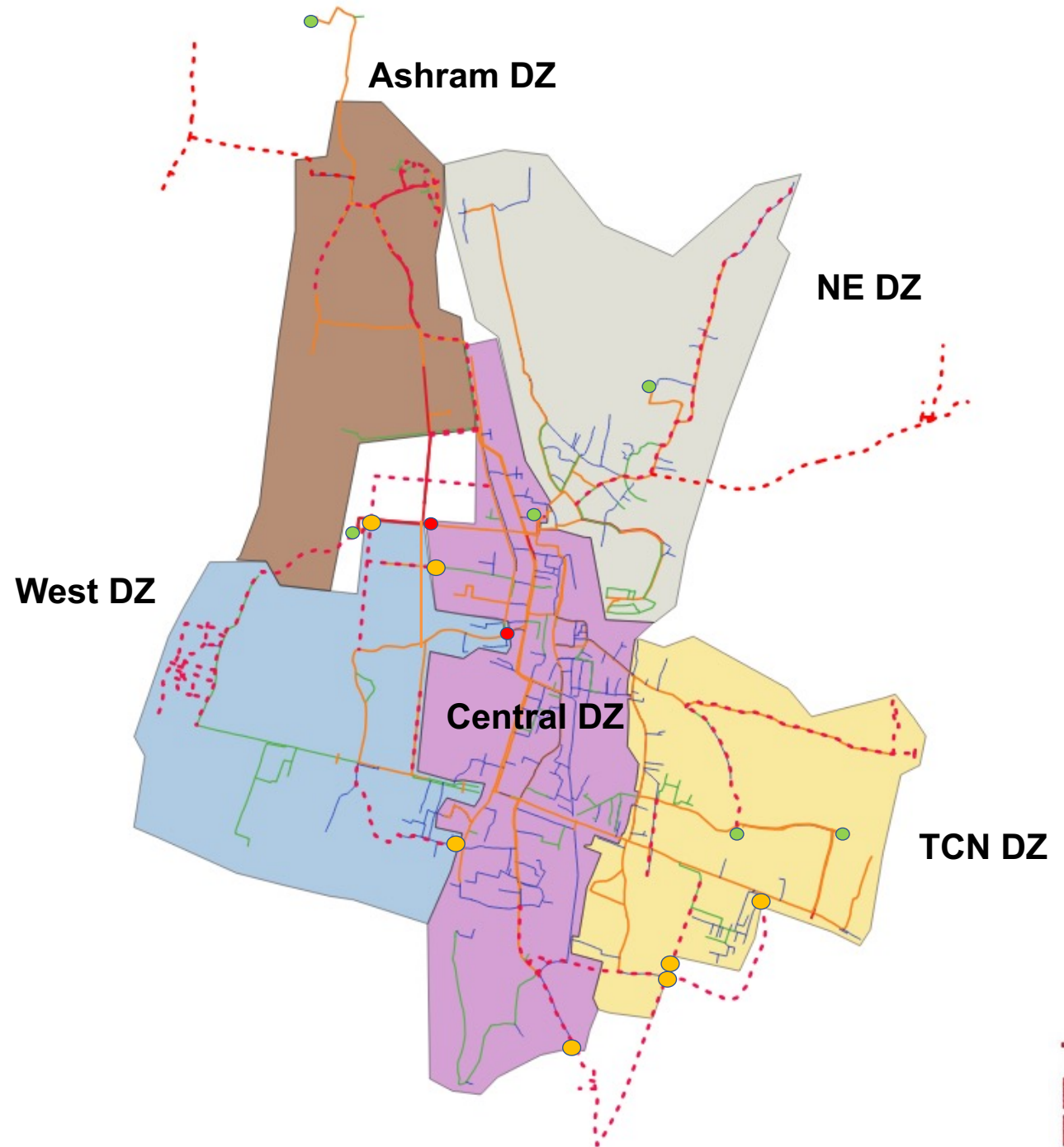
7.9 - 10

● Operational site / BH

- - - Growth main or surveyed main

● Constructed BV

● Realised or actual breach



Growth in Lahan

Mains Diameter (")

- 0.0 - 0.9
- 0.9 - 2.9
- 2.9 - 3.9
- 3.9 - 7.9
- 7.9 - 10

- Operational site / BH
- - Growth main or surveyed main

Bastipur (135HH)
Peak flow 1.5 l/s
Assessed 2023

Dhansawar (162HH)
Peak flow 1.8 l/s
Assessed 2022

Padariya (482HH)
Peak flow 5.5 l/s
Assessed 2023

Gudigaun (338HH)
Peak Flow 4.6 l/s
Assessed 2022

Balansher (99HH)
Peak Flow 1.1 l/s
Assessed 2023

Sundarpur & Islampur (66HH)
Peak Flow 0.8 l/s
Assessed 2022

Ashram 2 > 15 l/s

GRAMIN_2

NE2 > 20 l/s

New tank 450m3
BHA2 & 3 > 31 l/s

Flag Park
OC3 & 8 19 l/s
Old Tank 450m3

TCN 1 & 2 > 23 l/s

Distribution Zone (DZ) Revised Design

Central DZ Input is Ashram and OHT outlet (OHT requires 1 meter)

NE DZ Input is NE_1 & NE_2 meters or WT meter if added (Phase 2)

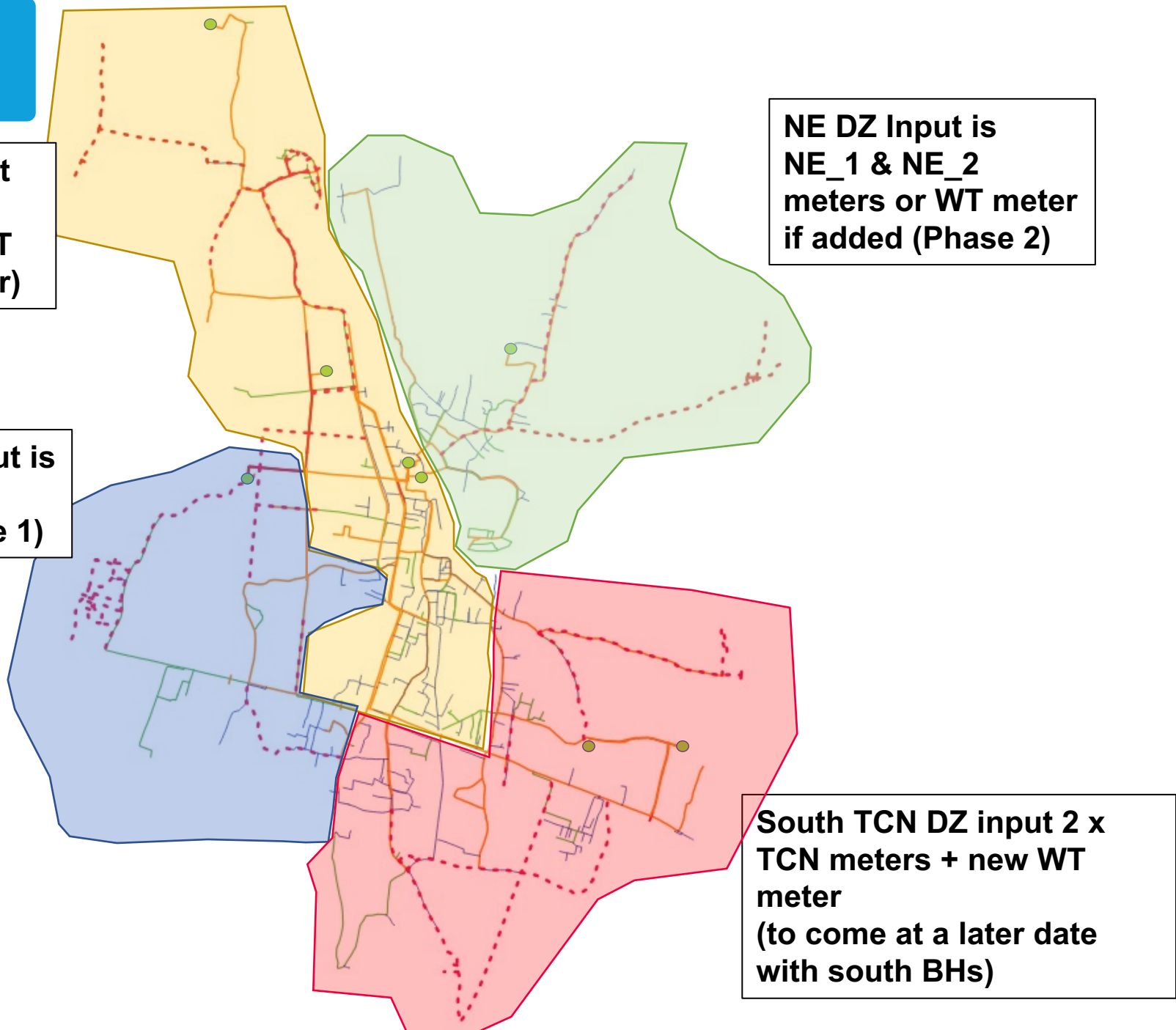
West DZ Input is existing WT meter (Phase 1)

Mains Diameter (")

- 0.0 - 0.9
- 0.9 - 2.9
- 2.9 - 3.9
- 3.9 - 7.9
- 7.9 - 10

● Operational site / BH

- - Growth main or surveyed main



South TCN DZ input 2 x TCN meters + new WT meter (to come at a later date with south BHs)

DZ Phase 1

- Create west DZ first
- Requires Gramin_2 in service
- Requires cross connection and 3 x valves
- Accommodates growth in Padariya
- Smaller area to resolve leakage and meter anomalies – demonstrate the value of low UFW upon revenue

Mains Diameter (“)

— 0.0 - 0.9

— 0.9 - 2.9

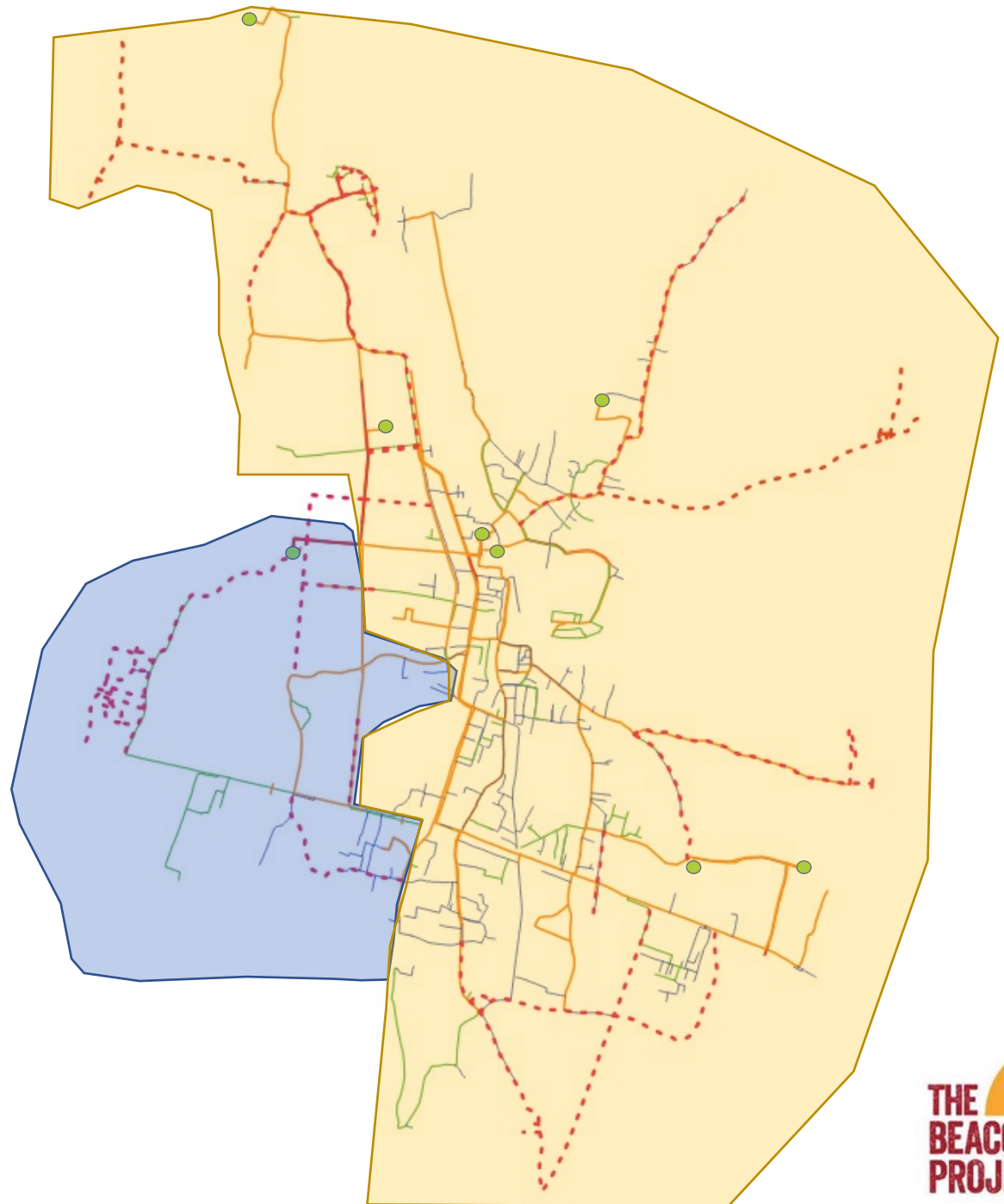
— 2.9 - 3.9

— 3.9 - 7.9

— 7.9 - 10

● Operational site / BH

- - Growth main or surveyed main



DZ Phase 2

- Create NE DZ second
- Requires method of BH control or additional small WT
- Requires 2 x valves on bridge
- Enables improved understanding of UFW level in 3 x smaller areas

Mains Diameter (")

0.0 - 0.9

0.9 - 2.9

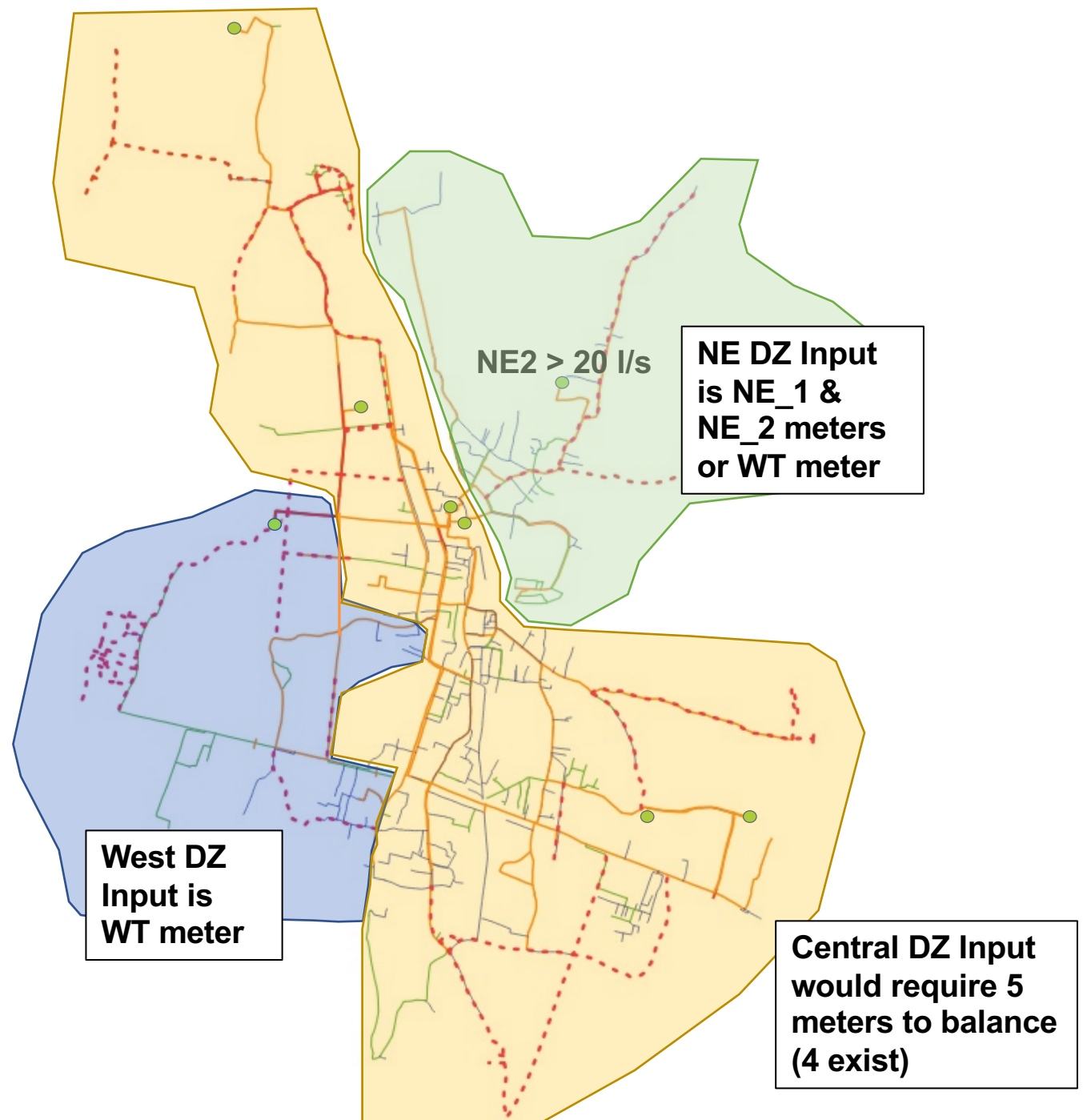
2.9 - 3.9

3.9 - 7.9

7.9 - 10

● Operational site / BH

- - Growth main or surveyed main



Water Balance Calculations

Uncertainty with the calculated NRW level ~ between 36% and 66% depending on data used and assumptions made (see next slide – 4 versions of balance)

Issues with groups of customer meters;:

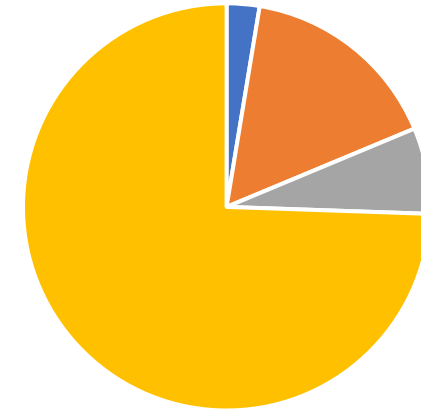
- 17% of customer meters offline or defective
- 3% of customers could not be read
- 7% of customers had no meter or no data on current meter

4 Versions of balance are:

- 1a > Input estimated from operators and unadjusted meter readings
- 1b > Input estimated from operators and adjusted meter readings
- 2a > Input from EMF totaliser values and unadjusted meter readings
- 2b > Input from EMF totaliser values and adjusted meter readings

To undertake version 1b. and 2b. Balance, estimated 27% of customer usage based on average consumption of 73%

Meter Readings (July / August 23)



- Unable to access (3%)
- Defective meter (17%)
- No meter or no data (7%)
- Meter satisfactory (73%)

System Input Volume	Authorized Consumption	Billed Authorized Consumption	Billed Metered Consumption	Revenue Water
			Billed Unmetered Consumption	
		Unbilled Authorized Consumption	Unbilled Metered Consumption	Non-Revenue Water
			Unbilled Unmetered Consumption	
Water Losses	Apparent Losses		Unauthorized Consumption	
			Metering Inaccuracies and Data Handling Errors	
	Real Losses		Leakage on Transmission and/or Distribution Mains	
		Leakage and Overflows at Utility's Storage Tanks		
			Leakage on Service Connections up to Point of Customer Metering	

IWA water balance components

Water Balance Wards 1-10

Version	System Input type	System Input (MLD)	Data Source: Consumption	Consumption (MLD)	NRW (Input – Consumption) (%)
1a	Borehole flowrate and duration estimations from operators	5.29	Unadjusted meter readings	1.81	3.37 MLD 66%
1b	Borehole flowrate and duration estimations from operators	5.29	Adjusted meter readings*	2.33	2.95 MLD 56%
2a	Electro-Magnetic Flowmeter totalisers**	3.62	Unadjusted meter readings	1.81	1.81 MLD 50%
2b	Electro-Magnetic Flowmeter totalisers**	3.62	Adjusted meter readings*	2.33	1.29 MLD 36%

Adjusted Consumer Usage: Revenue Implications

The meter readings investigation results in:

- 1,014 customers underpaying (27% of all customers)
- The tariff for consuming '0 m³' = 110 NPR
- The tariff for consuming 19.87 m³ = 360 NPR
- The change in revenue if charged correctly:
 - = 1,014 x (360-110)
 - = 253,500 NPR/month (£1,550 /month)

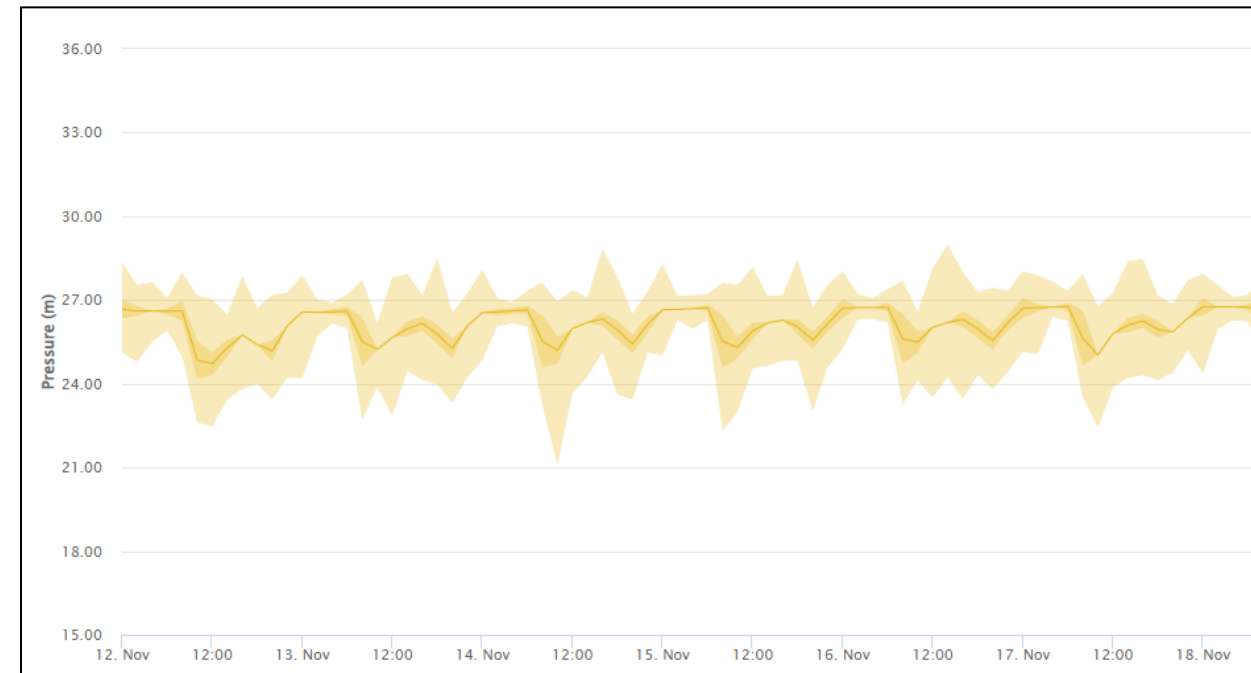
This is equivalent to a 20.5% increase in revenue.

Focus Areas - Networks

- Developing West DZ in 2024
- Flow and Pressure data being housed on the i20 portal – more visibility of data
- Fix / replace defective customer meters
- Improving water balance with more consistent flow data (inputs and outputs)
- Determine how we can extend supply hours and Integrate new BHs
- Planning network growth in parallel with DZ development
- Planning network development in Wards 13, 14 and 24
- Longer term planning for network to support 5-year investment horizon



New BH south of the Highway being drilled



Example pressure trend from i20 logger

Thank you!



**Further information on the Beacon Project can be found at
<https://washmatters.wateraid.org/the-beacon-project>**