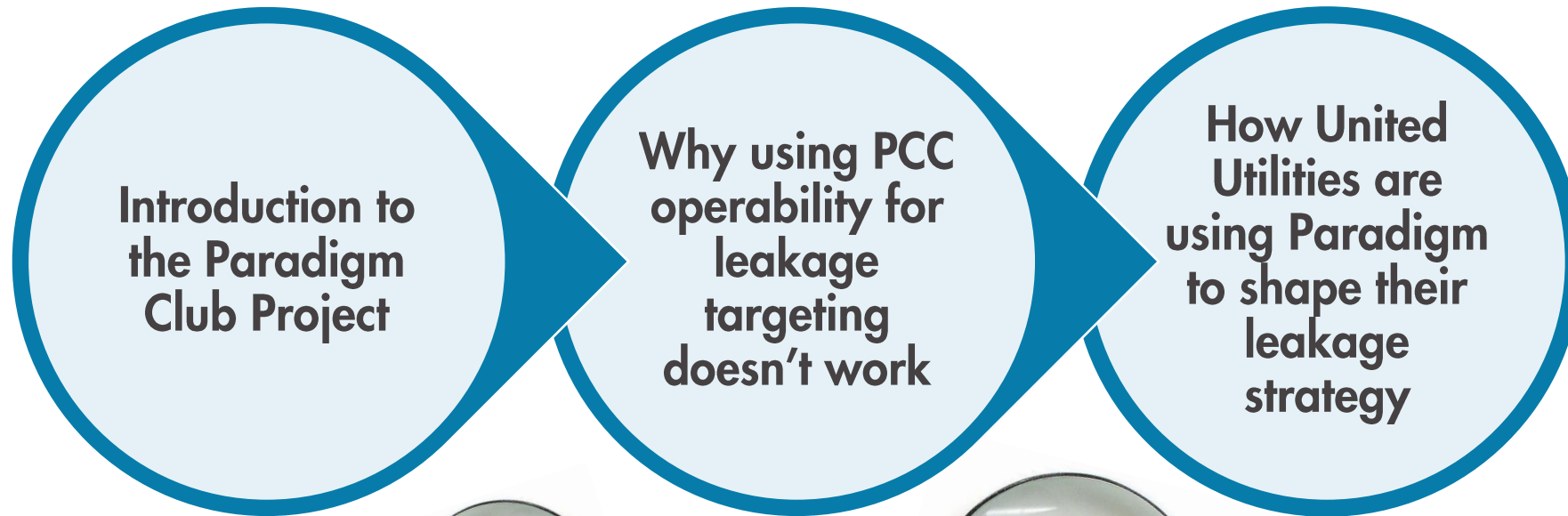


The Paradigm Club Project

Challenging operability and shaping our leakage strategy

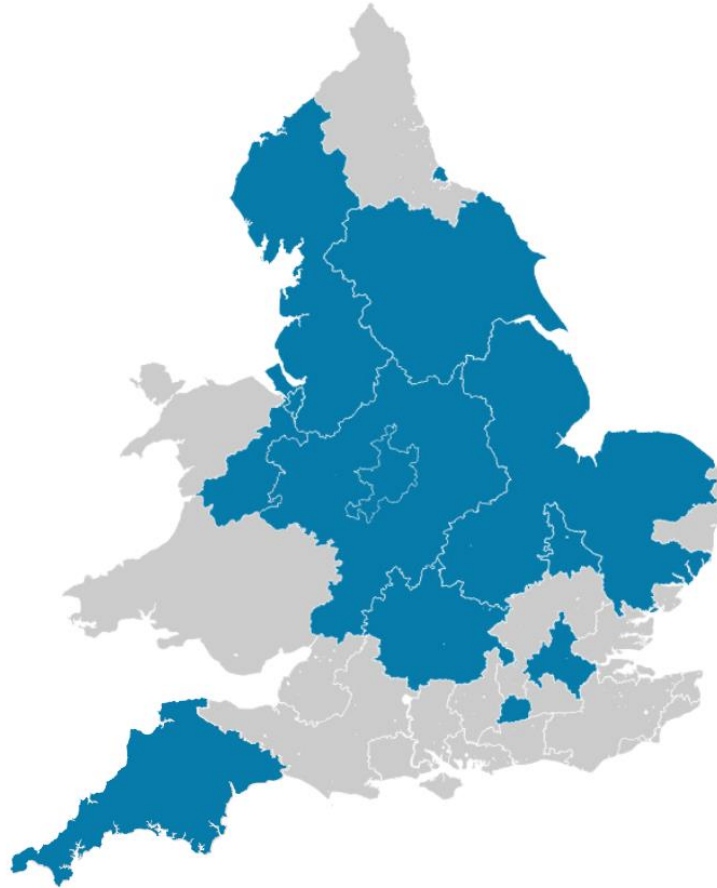
03/12/2024

Agenda



Club Project members

- Four companies came on board at the start of the 3-year Paradigm Club Project in October 2022.
- Yorkshire Water, Thames Water and South West Water joined the second year of the project.
- We now analyse data for DMAs covering 70% of properties in England with Paradigm.



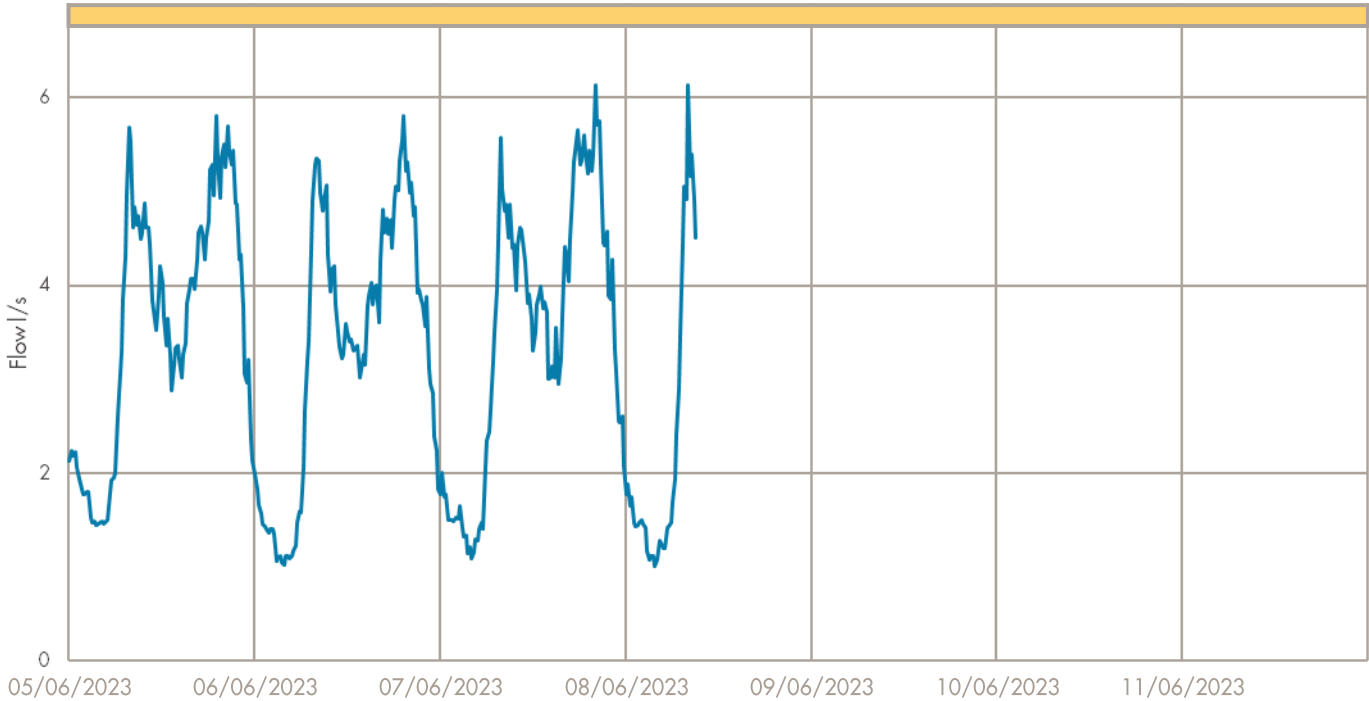
Paradigm user base



Case Study: DMA 157-07



157-07 - Acton Bridge



- Actual net flow
- Unaccounted-for water
- Modelled profile
- Model components
 - Leakage
 - Household
 - Non-household

Data Summary

Activity

Paradigm Rating and Analysis

★★★★★

Properties Summary

Category	Count
total	450
hh	392
nhh	58
ageing communities	380
Other	12

Demand Summary

HH: 78%

NHH: 22%

Case Study: DMA 157-07

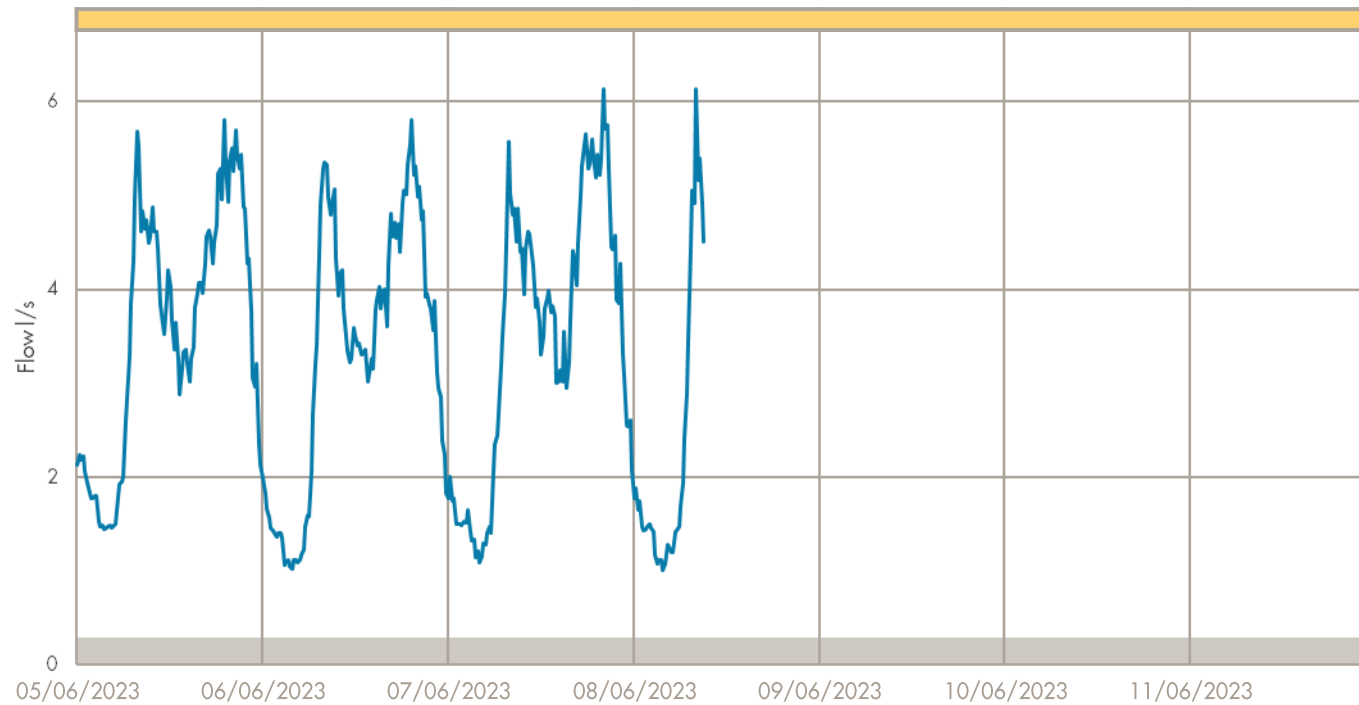
Export

Company Overview

Activity Workbook

Jump to DMA

157-07 - Acton Bridge



— Actual net flow
— Unaccounted-for water
— Modelled profile

Model components
— Leakage
— Household
— Non-household

Data Summary

Activity

Paradigm Rating and Analysis

★★★★★

Properties Summary



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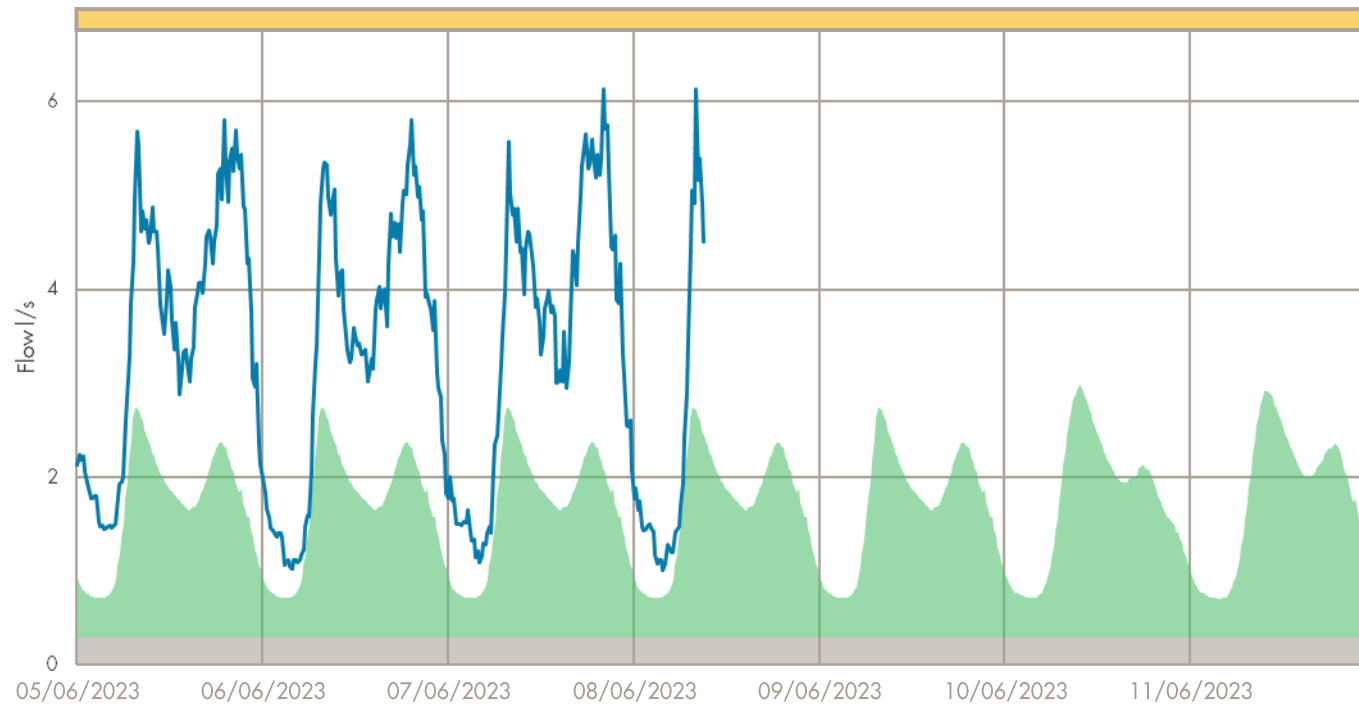
Export

Company Overview

Activity Workbook

Jump to DMA

157-07 - Acton Bridge



— Actual net flow
— Unaccounted-for water
— Modelled profile

Model components
— Leakage
— Household
— Non-household

Data Summary

Activity

Paradigm Rating and Analysis

★★★★★

Properties Summary



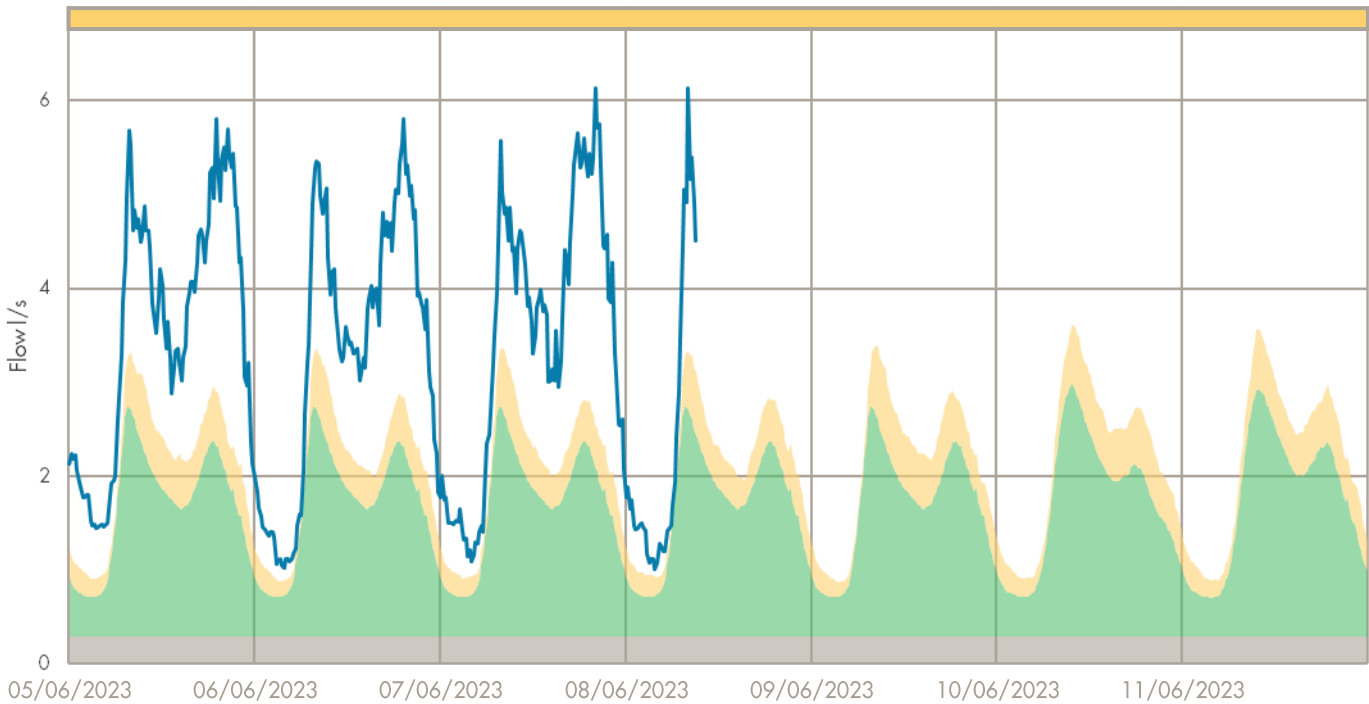
Demand Summary

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Case Study: DMA 157-07



157-07 - Acton Bridge



Data Summary

Activity

Paradigm Rating and Analysis

★★★★★

Properties Summary

Category	Count
total	450
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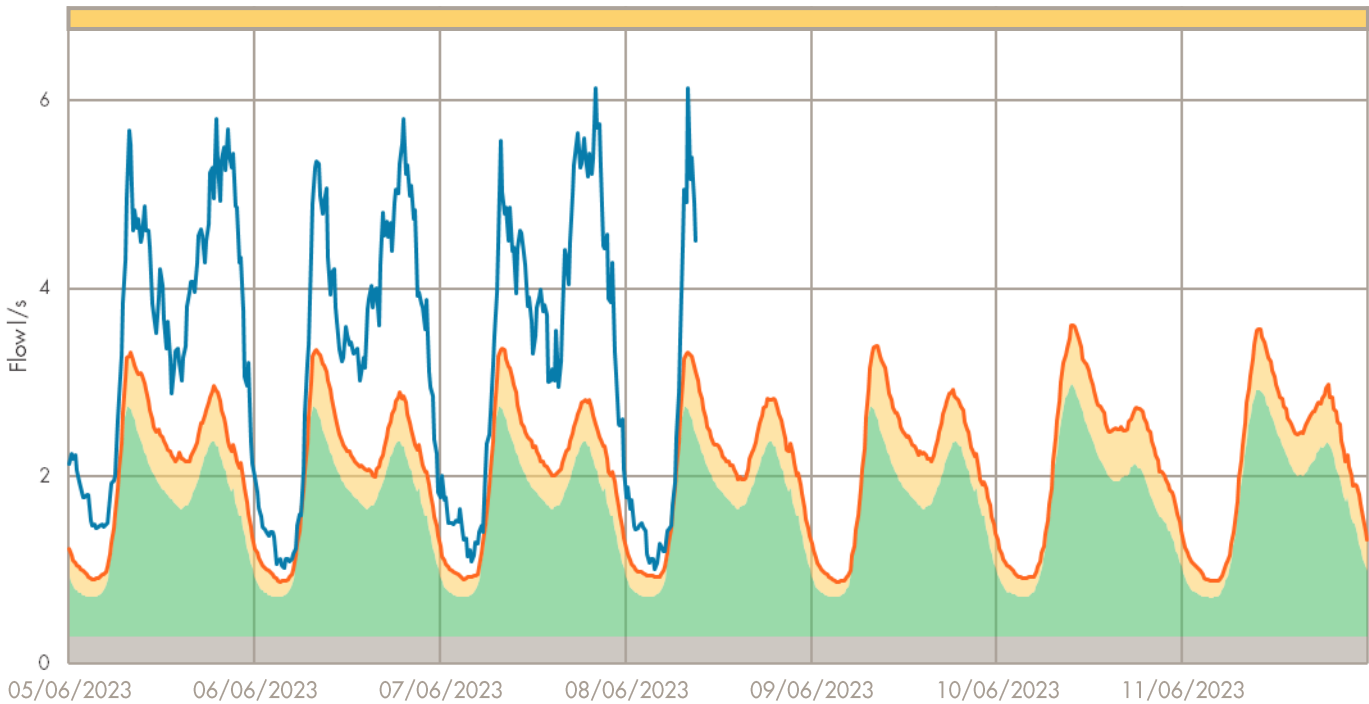
Demand Summary

Category	Percentage
HH	78%
NHH	22%

Case Study: DMA 157-07



157-07 - Acton Bridge



Data Summary

Activity

Paradigm Rating and Analysis

★★★★★

Properties Summary

Category	Count
total	450
hh	392
nhh	58
ageing communities	380
young families	12

Demand Summary

Category	Percentage
HH	78%
NHH	22%

Case Study: DMA 157-07

Export

Company Overview

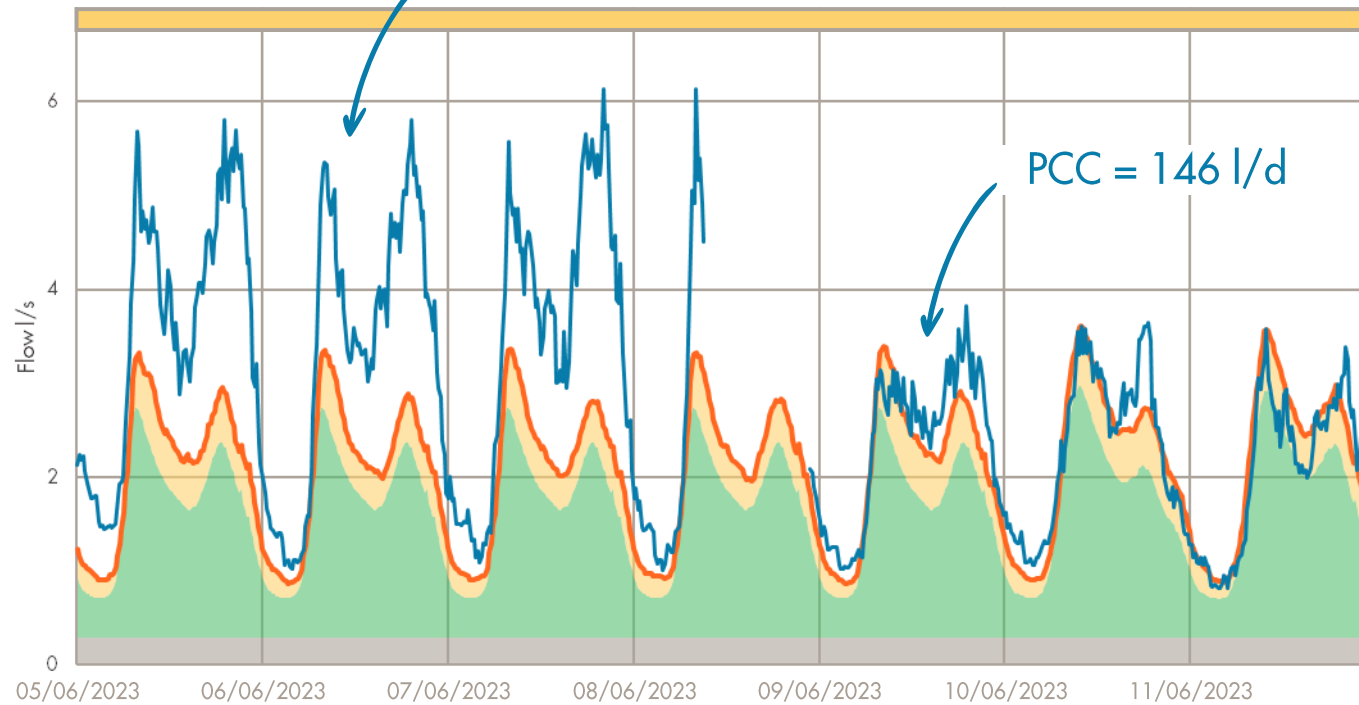
Activity Workbook

Jump to DMA

157-07 - Acton Bridge

PCC = 245 l/d

PCC = 146 l/d



Actual net flow
Unaccounted-for water
Modelled profile

Model components
Leakage
Household
Non-household

Data Summary

Activity

Paradigm Rating and Analysis

★★★★★

Properties Summary



Demand Summary

HH: 78% NHH: 22%

Paradigm vs Operability

Paradigm uses 5 categories for DMA analysis

	Operable	Non-Operable
Maintain	99%	1%
Leakage	96%	4%
Integrity (Demand)	99%	1%
Integrity (Physical)	98%	2%
Data	52%	48%

DMA's are typically operable in four of the categories

The majority of the non-operable DMA's sit in the **Data** category

Paradigm vs Operability

Maintain is for DMAs
that match the model
well



	Operable	Non-Operable
Maintain	99%	1%
Leakage	96%	4%
Integrity (Demand)	99%	1%
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Paradigm vs Operability

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Paradigm vs Operability

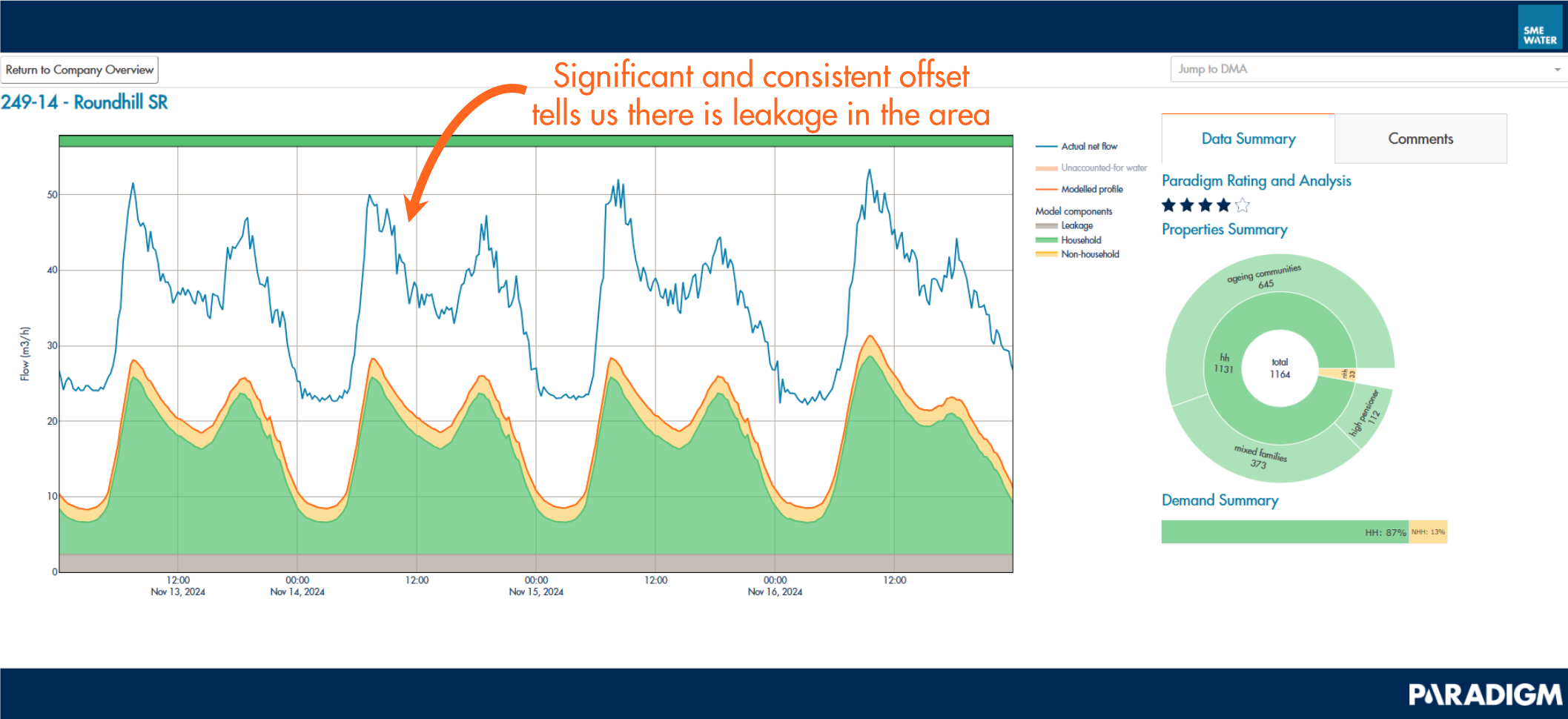


Leakage is used where we think there is a leakage problem in the area

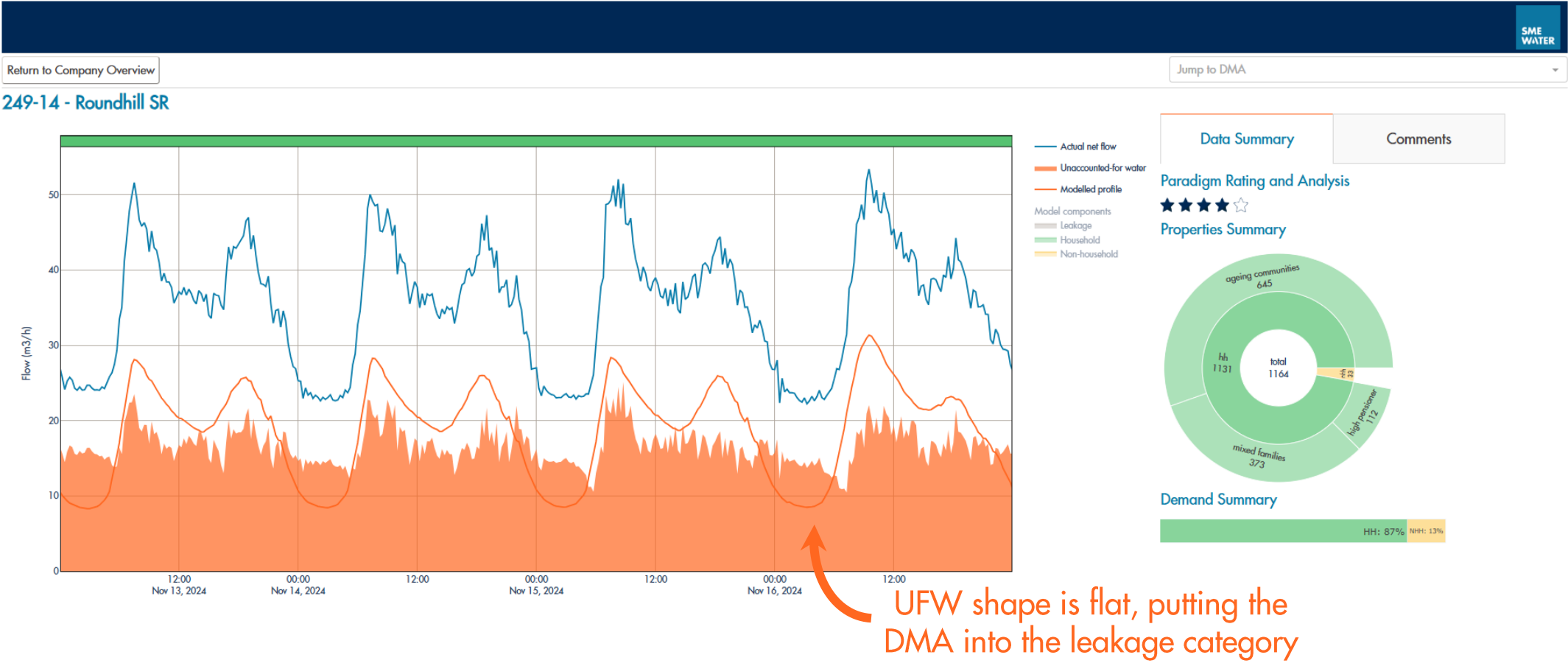
	Operable	Non-Operable
Maintain	99%	1%
Leakage	96%	4%
Integrity (Demand)	99%	1%
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Data	52%	48%



Paradigm vs Operability



Paradigm vs Operability



Paradigm vs Operability



Leakage is used where we think there is a leakage problem in the area

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Paradigm vs Operability

Operable Non-Operable

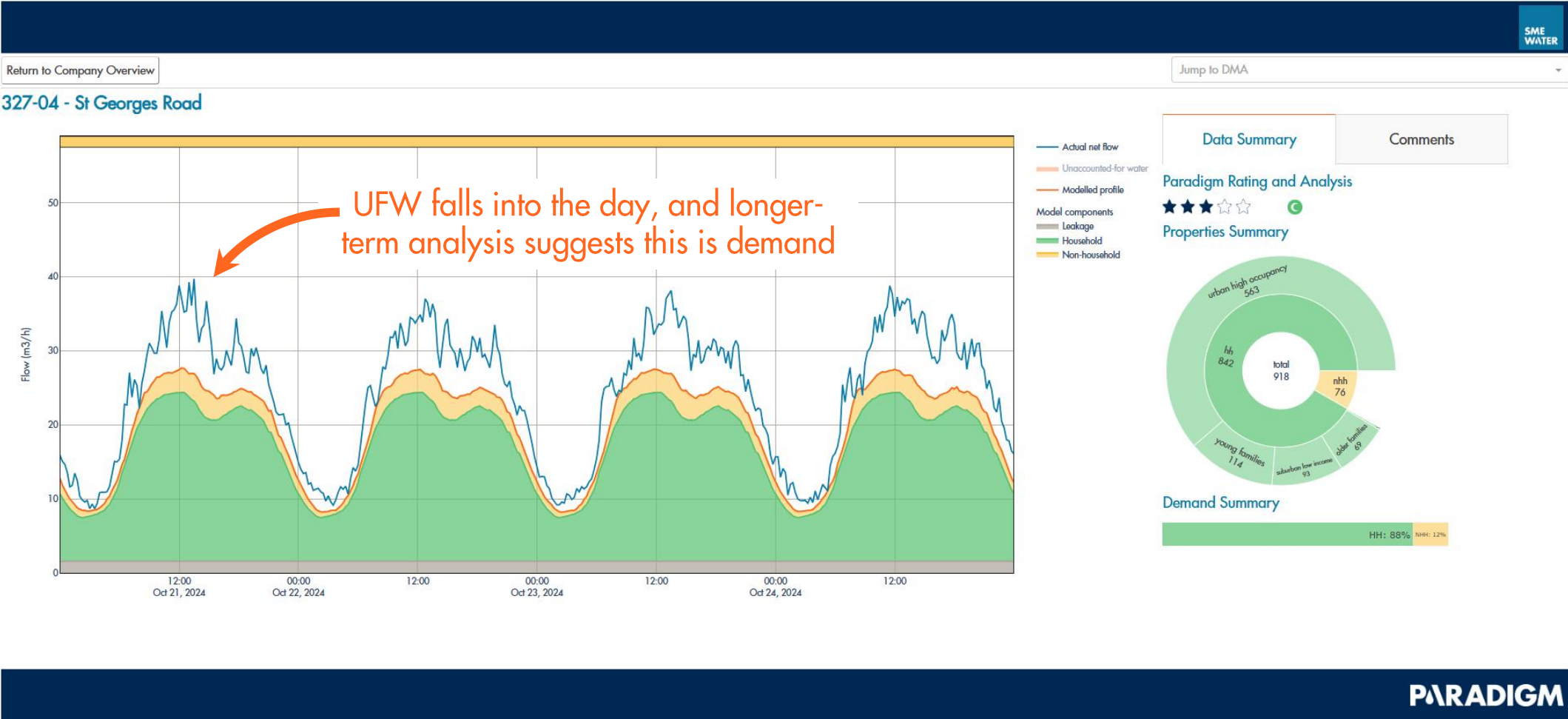
Maintain	99%	1%
Leakage	96%	4%
Integrity (Demand)	99%	1%
Integrity (Physical)	98%	2%
Data	52%	48%



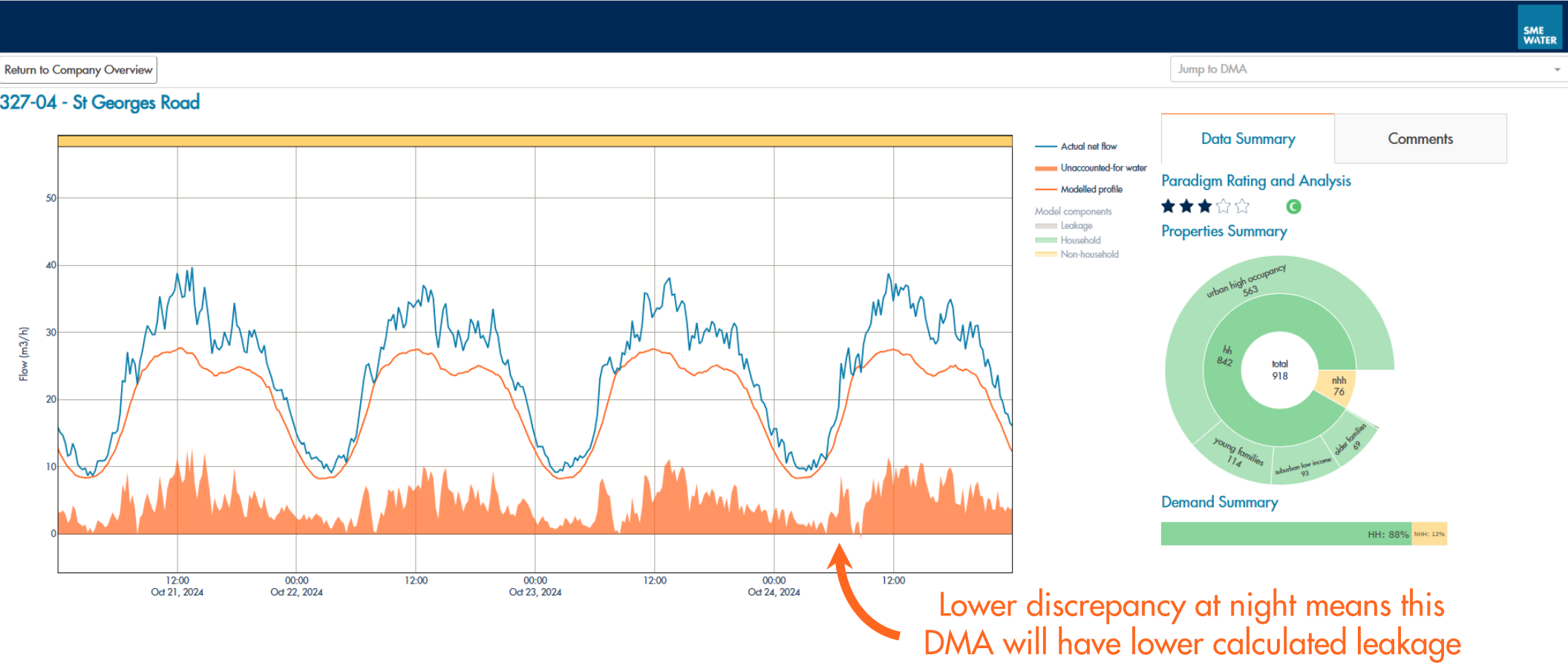
We put DMAs into Integrity when we think there is a problem with demand or the DMAs boundary



Paradigm vs Operability



Paradigm vs Operability



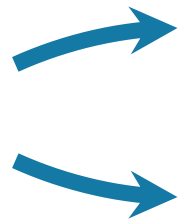
Paradigm vs Operability

Operable Non-Operable

Maintain	99%	1%
Leakage	96%	4%
Integrity (Demand)	99%	1%
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Data	52%	48%



We put DMAs into Integrity when we think there is a problem with demand or the DMAs boundary



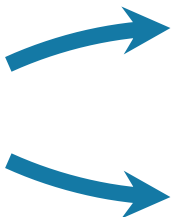
Paradigm vs Operability

Operable Non-Operable

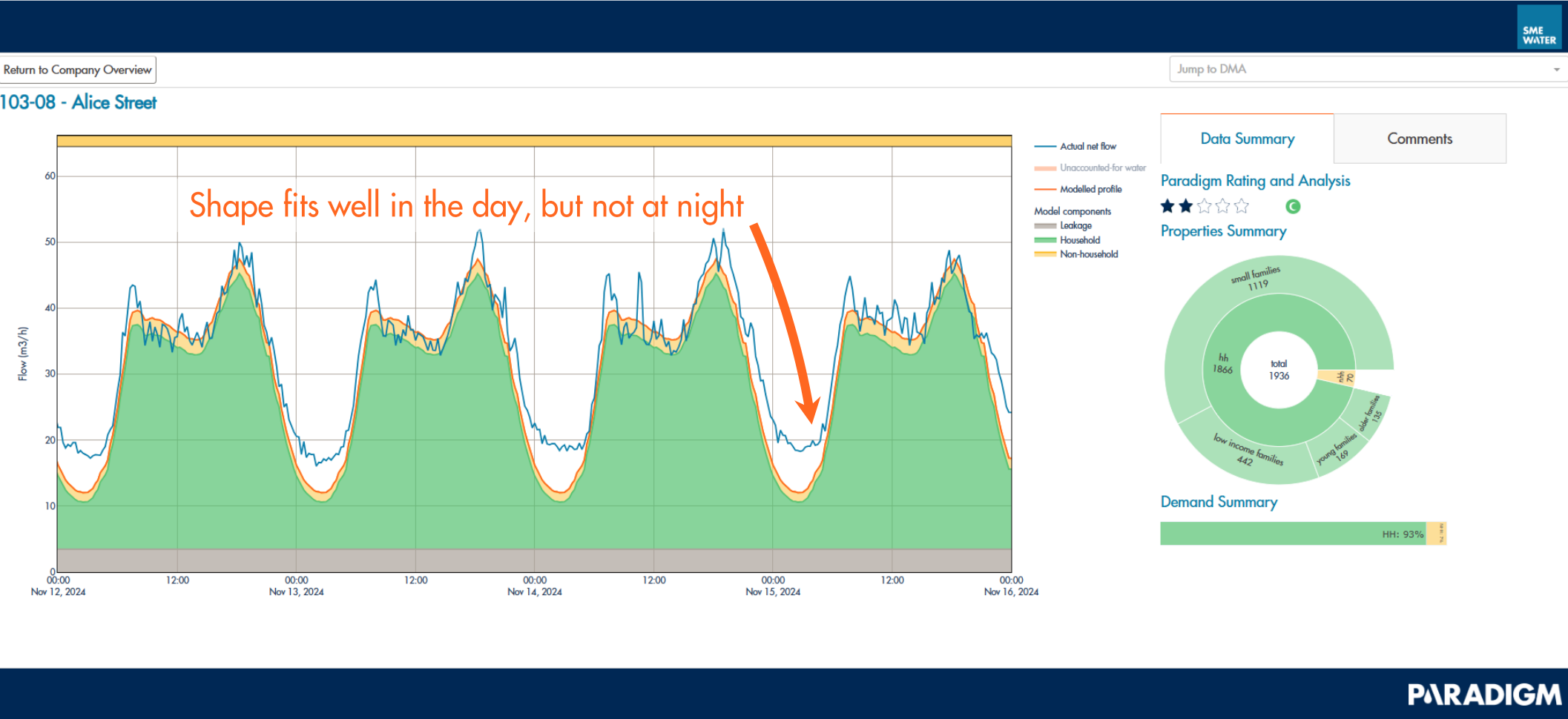
Maintain	99%	1%
Leakage	96%	4%
Integrity (Demand)	99%	1%
Integrity (Physical)	98%	2%
Data	52%	48%



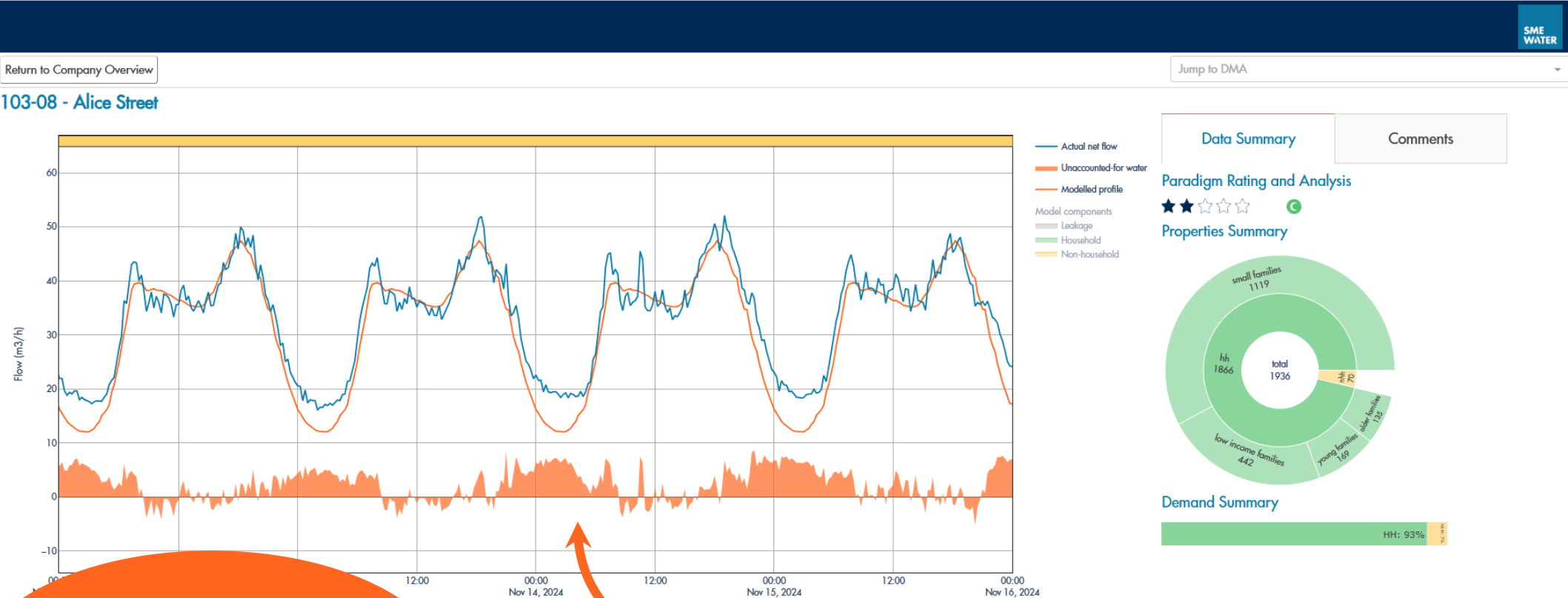
We put DMAs into Integrity when we think there is a problem with demand or the DMAs boundary



Paradigm vs Operability



Paradigm vs Operability



80m³/day leakage
Vs
40m³/day UFW

Night-time discrepancy treated as leakage

Paradigm vs Operability

Operable Non-Operable

Maintain	99%	1%
Leakage	96%	4%
Integrity (Demand)	99%	1%
Integrity (Physical)	98%	2%
Data	52%	48%



We put DMAs into Integrity when we think there is a problem with demand or the DMAs boundary



Paradigm vs Operability

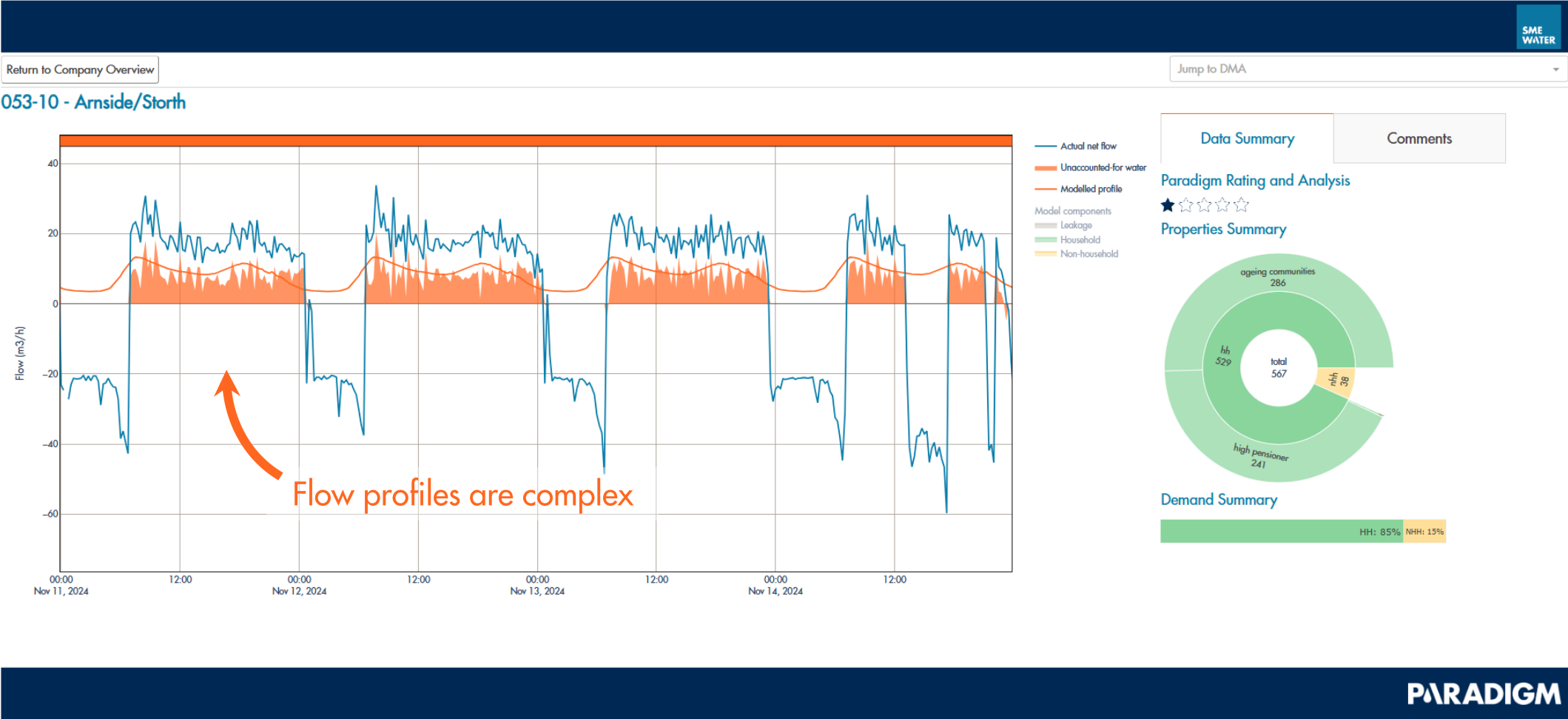
	Operable	Non-Operable
Maintain	99%	1%
Leakage	96%	4%
Integrity (Demand)	99%	1%
Integrity (Physical)	98%	2%
Data	52%	48%



The Data category is used when the net flow bares little resemblance to the modelled profile



Paradigm vs Operability



Paradigm vs Operability



Paradigm vs Operability

	Operable	Non-Operable
Maintain	99%	1%
Leakage	96%	4%
Integrity (Demand)	99%	1%
Integrity (Physical)	98%	2%
Data	52%	48%



The Data category is used when the net flow bares little resemblance to the modelled profile



Paradigm vs Operability

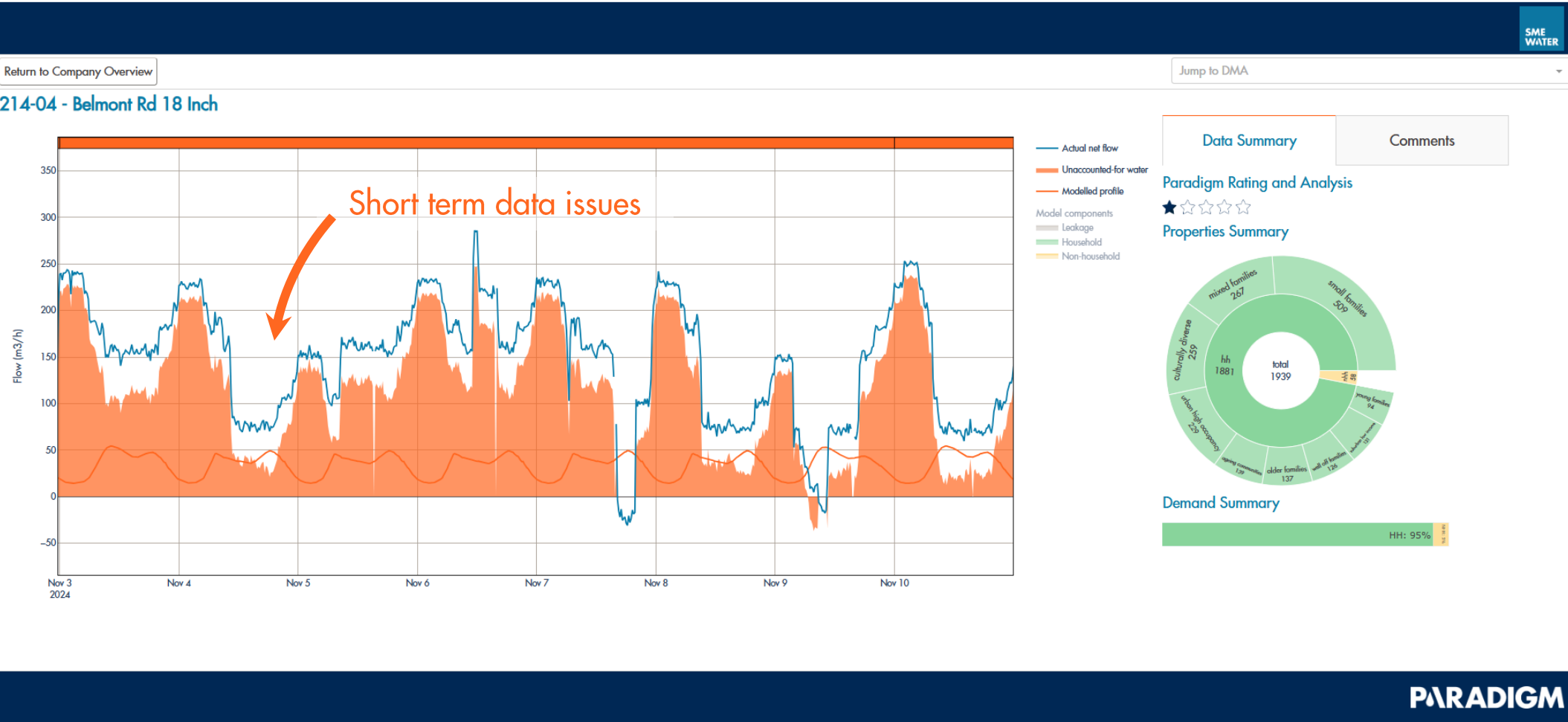
	Operable	Non-Operable
Maintain	99%	1%
Leakage	96%	4%
Integrity (Demand)	99%	1%
Integrity (Physical)	98%	2%
Data	52%	48%



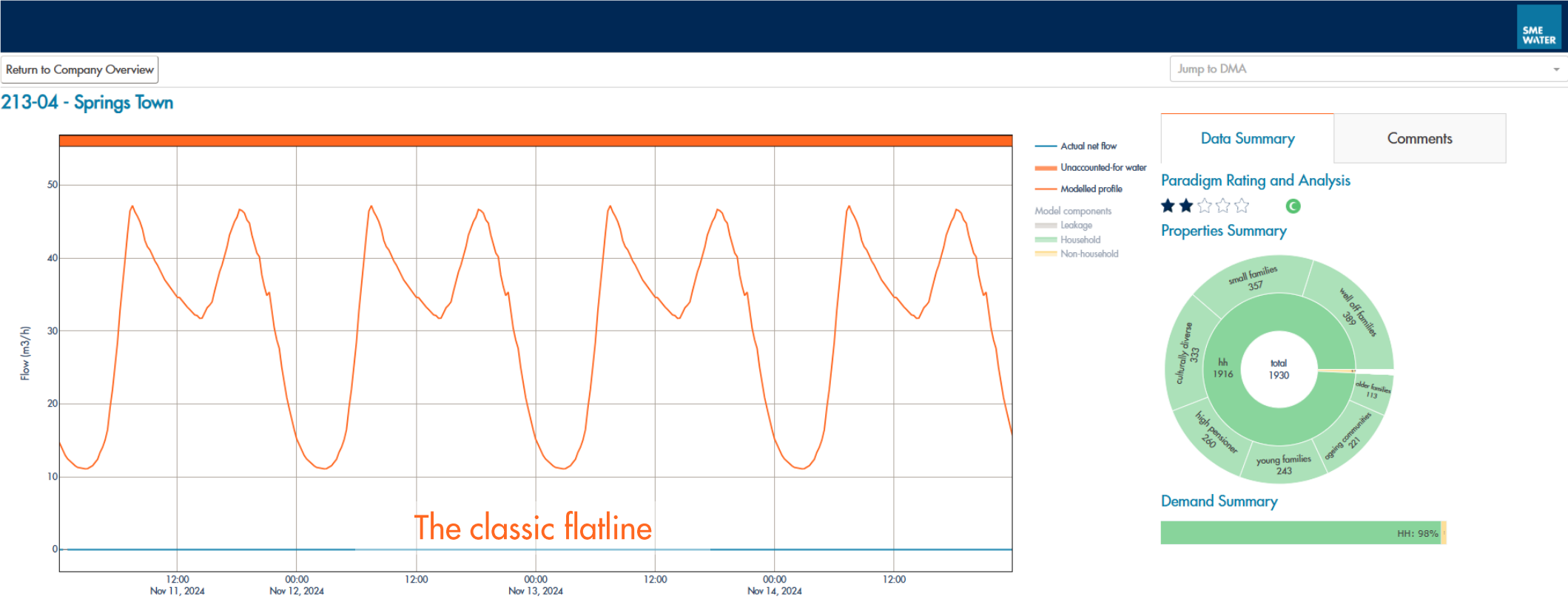
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Paradigm vs Operability



Paradigm vs Operability



Paradigm vs Operability

The Data category is used when the net flow bares little resemblance to the modelled profile



	Operable	Non-Operable
Maintain	99%	1%
Leakage	96%	4%
Integrity (Demand)	99%	1%
Integrity (Physical)	98%	2%
Data	52%	48%



Paradigm vs Operability

This is why using PCC operability for leakage targeting doesn't work...

	Operable	Non-Operable
Maintain	99%	1%
Leakage	96%	4%
Integrity (Demand)	99%	1%
Integrity (Physical)	98%	2%
Data	52%	48%

Paradigm vs Operability

This is why using PCC operability for leakage targeting doesn't work...

...we have areas we are doing the right thing...

	Operable	Non-Operable
Maintain	99%	1%
Leakage	96%	4%
Integrity (Demand)	99%	1%
Integrity (Physical)	98%	2%
Data	52%	48%

Paradigm vs Operability

This is why using PCC operability for leakage targeting doesn't work...

...we have areas we are doing the right thing...

...but a lot of areas where we should be doing something different.

	Operable	Non-Operable
Maintain	99%	1%
Leakage	96%	4%
Integrity (Demand)	99%	1%
Integrity (Physical)	98%	2%
Data	52%	48%

Paradigm vs Operability

Looking at the percentage of operable DMAs in each category...

	Operable	% of Op DMAs
Maintain	99%	40%
Leakage	96%	15%
Integrity (Demand)	99%	5%
Integrity (Physical)	98%	31%
Data	52%	9%

Paradigm vs Operability

Looking at the percentage of operable DMAs in each category...

	Operable	% of Op DMAs
Maintain	99%	40%
Leakage	96%	15%
Integrity (Demand)	99%	5%
Integrity (Physical)	98%	31%
Data	52%	9%

...only 55% of operable DMAs can be targeted for leakage with confidence...

...40% of operable DMAs can't be targeted with confidence in the return

'Data' leakage blurs the picture

Shaping our strategy

Courtney Connor, Leakage Technical Manager

Shaping our strategy

We're now going to look at how UU's DMAs sit across the 5 categories...

...and explore what insight this gives us

	Calculated Leakage	Paradigm UFW
Maintain		
Leakage	58%	63%
Integrity (Demand)		
Integrity (Physical)	42%	37%
Data		

As a reminder...

Paradigm looks at UFW over the day – focusing on day, night and intraday analysis (m3/d)...

...whereas we're used to talking Leakage – using the fixed MNF window 03:00-04:00 (m3/hr)

Shaping our strategy

Now let's introduce the idea of **confidence**...

...and start asking some important questions...

	Calculated Leakage	Paradigm UFW	Confidence
Maintain			
Leakage	58%	63%	?
Integrity (Demand)			?
Integrity (Physical)	42%	37%	?
Data			?

Do our DMAs make **sense**?



Do we have the **correct** leakage targets?



Can we **trust** their calculated leakage figures?



Can we **action** them with confidence?

Shaping our strategy

	Calculated Leakage	Paradigm UFW	Confidence
Maintain	58%	63%	High (Leakage)
Leakage			
Integrity (Demand)	42%	37%	
Integrity (Physical)			
Data			

Shaping our strategy

	Calculated Leakage	Paradigm UFW	Confidence
Maintain	58%	63%	High (Leakage)
Leakage			
Integrity (Demand)	42%	37%	High (Demand)
Integrity (Physical)			
Data			

Shaping our strategy

	Calculated Leakage	Paradigm UFW	Confidence
Maintain	58%	63%	High (Leakage)
Leakage			
Integrity (Demand)	42%	37%	High (Demand)
Integrity (Physical)			Low
Data			

Shaping our strategy

	Calculated Leakage	Paradigm UFW	Confidence
Maintain	58%	63%	High (Leakage)
Leakage			
Integrity (Demand)	42%	37%	High (Demand)
Integrity (Physical)			Low
Data			None

Shaping our strategy

	Calculated Leakage	Paradigm UFW	Confidence
Maintain	58%	63%	High (Leakage)
Leakage			
Integrity (Demand)	42%	37%	High (Demand)
Integrity (Physical)			Low
Data			None

Around **60%** of
calculated leakage and
UFW sit in our high
confidence areas...

Shaping our strategy

But when we split by
Maintain vs Leakage we
get a different picture...

2/3 sits in the UFW
Leakage category...

	Calculated Leakage	Paradigm UFW	Confidence
Maintain	30%	20%	High (Leakage)
Leakage	28%	43%	
Integrity (Demand)	42%	37%	High (Demand)
Integrity (Physical)			Low
Data			None

Shaping our strategy

But when we split by Maintain vs Leakage we get a different picture...

2/3 sits in the UFW Leakage category...

	Calculated Leakage	Paradigm UFW	Confidence
Maintain	30%	20%	High (Leakage)
Leakage	28%	43%	
Integrity (Demand)	42%	37%	High (Demand)
Integrity (Physical)			Low
Data			None

More accurate demand analysis gives us a better understanding of where leakage is



Improved DMA prioritisation



A regional, flexible approach to resource allocation

Improved targeting

Shaping our strategy

But when we split by
Maintain vs Leakage we
get a different picture...

2/3 sits in the UFW
Leakage category...

What about the 1/3 left
in Maintain?

	Calculated Leakage	Paradigm UFW	Confidence
Maintain	30%	20%	High (Leakage)
Leakage	28%	43%	
Integrity (Demand)	42%	37%	High (Demand)
Integrity (Physical)			Low
Data			None

Shaping our strategy

But when we split by Maintain vs Leakage we get a different picture...

2/3 sits in the UFW Leakage category...

What about the 1/3 left in Maintain?

	Calculated Leakage	Paradigm UFW	Confidence
Maintain	30%	20%	High (Leakage)
Leakage	28%	43%	
Integrity (Demand)	42%	37%	High (Demand)
Integrity (Physical)			Low
Data			None

Only 4% is targetable leakage (16% is background leakage)

Background leakage challenge

Shaping our strategy

But when we split by Maintain vs Leakage we get a different picture...

2/3 sits in the UFW Leakage category...

What about the 1/3 left in Maintain?

	Calculated Leakage	Paradigm UFW	Confidence
Maintain	30%	20%	High (Leakage)
Leakage	28%	43%	
Integrity (Demand)	42%	37%	High (Demand)
Integrity (Physical)			Low
Data			None

Only 4% is targetable leakage (16% is background leakage)

A whopping 37% is targetable (6% is background leakage)

Shaping our strategy

	Calculated Leakage	Paradigm UFW	Confidence
Maintain	30%	20%	High (Leakage)
Leakage	28%	43%	
Integrity (Demand)	42%	37%	High (Demand)
Integrity (Physical)			Low
Data			None

Around **40%** of UFW and calculated leakage sits in our lower leakage confidence areas...

Shaping our strategy

Let's look at integrity issues...

	Calculated Leakage	Paradigm UFW	Confidence
Maintain	30%	20%	High (Leakage)
Leakage	28%	43%	
Integrity (Demand)	6%	6%	High (Demand)
Integrity (Physical)	20%	13%	Low
Data	17%	18%	None

Shaping our strategy

Let's look at integrity issues...

...in some areas
Paradigm tells us we are
missing customer
demand...

	Calculated Leakage	Paradigm UFW	Confidence
Maintain	30%	20%	High (Leakage)
Leakage	28%	43%	
Integrity (Demand)	6%	6%	High (Demand)
Integrity (Physical)	20%	13%	Low
Data	17%	18%	None

6% of UFW we have been
incorrectly targeting for
leakage



We need to deploy demand
analysis and investigation
instead of leakage teams

Find & fix
missing
demand

Shaping our strategy

Let's look at integrity issues...

...in some areas
Paradigm tells us we are
missing customer
demand...

...in others metering and
valve integrity, and
configuration issues, are
at play

	Calculated Leakage	Paradigm UFW	Confidence
Maintain	30%	20%	High (Leakage)
Leakage	28%	43%	
Integrity (Demand)	6%	6%	High (Demand)
Integrity (Physical)	20%	13%	Low
Data	17%	18%	None

Now aware of issues in
operable DMAs that we
didn't know were impacting
us



Recognise that we need to do
more to improve and
maintain DMAs

Collective
responsibility

Shaping our strategy

Let's look at data issues,
two types are at play...

...short term equipment
failure...

	Calculated Leakage	Paradigm UFW	Confidence
Maintain	30%	20%	High (Leakage)
Leakage	28%	43%	
Integrity (Demand)	6%	6%	High (Demand)
Integrity (Physical)	20%	13%	Low
Data	17%	18%	None

Make sure we resolve
equipment issues quickly and
effectively



Ensure the wider business
understands the impacts they
have and make funding
available

Resolve
equipment
issues faster

Collective
responsibility

Shaping our strategy

Let's look at data issues,
two types are at play...

...short term equipment
failure...

...and complex and
difficult to understand
DMAs

	Calculated Leakage	Paradigm UFW	Confidence
Maintain	30%	20%	High (Leakage)
Leakage	28%	43%	
Integrity (Demand)	6%	6%	High (Demand)
Integrity (Physical)	20%	13%	Low
Data	17%	18%	None

Can we configure these
areas to make them simpler?

OR

Can we improve data
availability to make them
analysable?

Simplify

Shaping our strategy

Prove our DMAs against Paradigm, then
manage them when they deviate



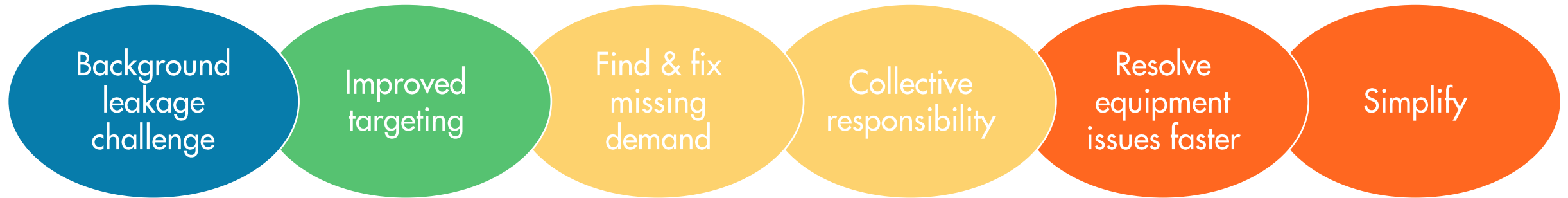
	Confidence	Strategy
Maintain		✓ Respond to breakout
Leakage	High (Leakage)	✓ Actively target for detection ✓ Regional approach to prioritisation, maximising the return from existing levels of resource ✓ Continue to focus on 'Prevent' activities to reduce leakage
Integrity (Demand)	High (Demand)	✓ Respond to breakout ✓ Focus analytical effort on demand investigations ✓ Heighten our focus on data management and quality assurance
Integrity (Physical)	Low	✓ Respond to breakout ✓ Galvanise operational support to resolve physical integrity issues
Data	None	✓ Respond to breakout (where possible) ✓ Galvanise wider support to invest in equipment and simplify DMAs to make then calculation and detection friendly

In Summary

- Operability is important for reporting but isn't suitable for validating DMAs for leakage targeting
 - ↳ From targeting 92% of DMAs to focusing on 55%
- Targeting DMAs with high confidence allows our leakage teams to be more efficient and effective
- Promoting collective responsibility for our DMAs and doing the "Right Thing in the Right Place"
- Realising the importance of applying **PALM** to 'data' leakage
 - ↳ **Prevent** data issues occurring through good maintenance and hygiene processes
 - ↳ **Awareness** of when things go wrong and reacting quickly to fix them
 - ↳ **Locating** the source of the issue (and the team!)
 - ↳ **Mending** the data issue promptly and in a sustainable way



Shaping our strategy



Any questions?