Assessment and Planning Programs for NRW and Asset Management

2nd ADB e-Marketplace | 19th October 2021

Contents

We are Isle Utilities (1/2)

PAUL HARRIS
Head of Business Consulting
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Paul has over forty (40) years of experience and is responsible for marketing, sales and delivery of business consulting engagements in Australia, New Zealand, Asia, Europe, North America and the Middle East. He has worked for nearly one hundred (100) water and energy utilities, and delivered strategic, regulatory, asset management, operations, customer service, technology and efficiency improvement for every major water utility in Australia.

GARY WYETH
Senior Consultant
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Gary has 30 years' experience in the water industry, with 27 of those years whilst working in South-East Asia.
During this period, he has gained member status of the CIWEM (UK) and is the current Secretary of the IWA Water Loss Specialist Group.

FARSHAD IBRAHIMI
Head of Asset Management
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Farshad has over twenty (20) years' experience in Australia and abroad, across Water, Transport and Energy sectors. He held global service line leadership roles in AM with international consultancies, as well as hands-on utility experience. He remains a highly active thought leader in the AM discipline, with the vision to helping raise awareness and implementation of AM excellence across the industry. Farshad currently leads the AMCV AM benchmarking program at Isle, and was Program Leader for the successful delivery of WSAA AMCV 2020, and Australia/NZ Region Coordinator for the 2008 and 2012 Programs.

We are Isle Utilities (2/2)

- Isle Utilities aims to create new value in industry through the identification and adoption of leading practices, technology and innovation
- Leading-edge, not bleeding-edge
- We are water industry specialists, but work in adjacent industries – mining, manufacturing, energy, agriculture
- We work for the international water industry - to solve real industry problems

6,000+
Technologies Reviewed

200+
Technologies Commercialised

200+
End Users

$1BN+
External Investment Secured

Our Consulting Ecosystem – Global

Assessment and Planning Programs

1. Leakage Management Benchmarking
2. NRW Management Planning
3. Asset Management Customer Value (AMCV)

LEAKAGE MANAGEMENT BENCHMARKING

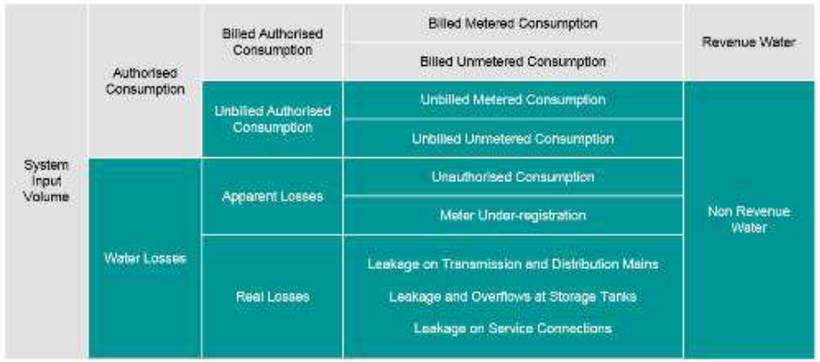
Program participants

Program benefits

Objective Performance Evidence	Your business is under water leakage management scrutiny from the economic regulator, customers or board, and must prove effective management processes are in place, and seeks objective performance assessment against world class industry peers.
Innovation	Your business is looking for the next innovation to minimise water leakage and wants to access leading practices in network management, technology and customer management.
Customised Improvement Pathways	Your business wants to identify and define performance gaps against world class industry peers, the pathway to improvement, and also seeks focused and customised practice improvement initiatives.
Investment Justification	Your business seeks to justify the need to invest in specific innovations and identified improvements in order to deliver reduced network and household water leakage.

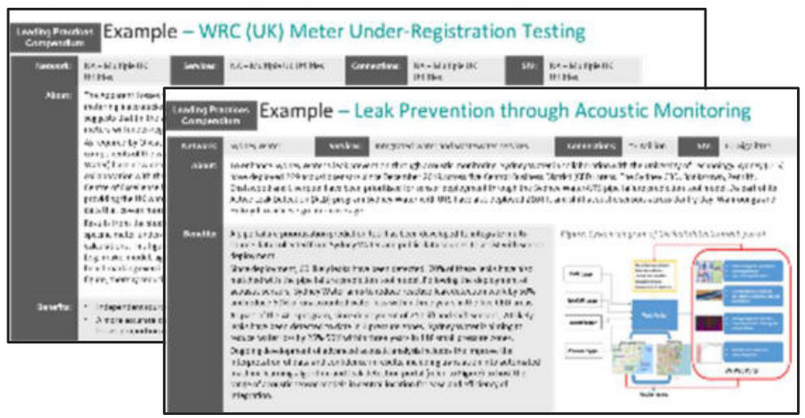
Program deliverables

1. Review of Non-Revenue Water (NRW) Balance, and develop your organisation's performance improvement recommendations



2. Review of Leakage Management Pillars, and develop your organisation's performance improvement recommendations

3. Industry Leading Practices Compendium, to guide your organisation's performance improvement



4. Industry Best Practice Workshop, providing opportunities for your organisation to share knowledge and network

NRW MANAGEMENT PLANNING

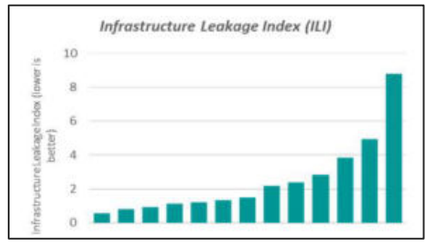
Program benefits

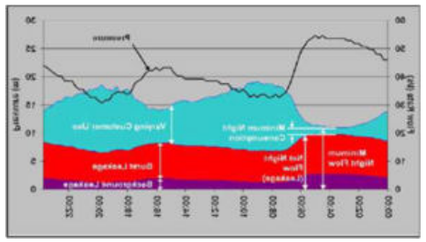
Data Gap Review	Review of all supplied data sets, required to undertake the NRW Management Planning project, including identification of areas of data strength, where the supplied data is weak and where further information is required.
Data Analysis	Analysis of all supplied data sets across our nine (9) areas of managing NRW, identifying where the utility is currently performing well and where additional activities are required to achieve the set NRW targets.
NRW Management Plan	Development of a comprehensive NRW Management Plan, detailing recommendations of activities to be undertaken to achieve the long term NRW targets.
10 Year Investment Plan	Development of a 10 year Investment Plan, detailing what costs are currently budgeted for and what additional works are required, including a comprehensive cost benefit analysis justifying the additional budget.

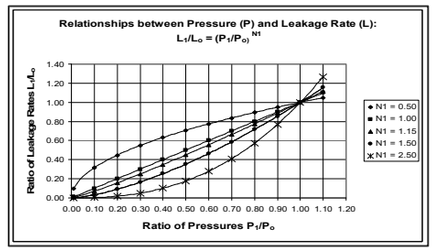
Program deliverables

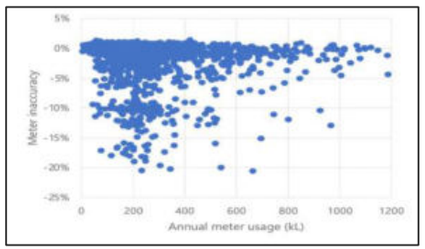
Non-Revenue Water (NRW) Management Planning (1)

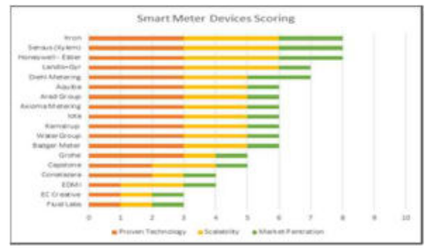
- Non-Revenue Water Balance
- DMA Reporting
- Active Leak Detection
- Pressure Management
- Meter Replacement
- Response Time
- Digitalisation
- Bulk Metering
- Asset Management

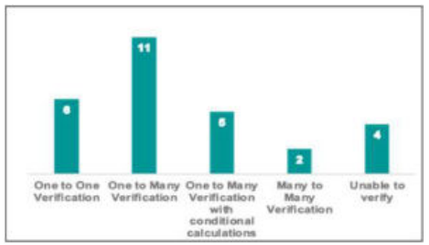


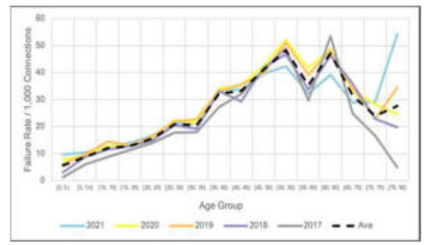


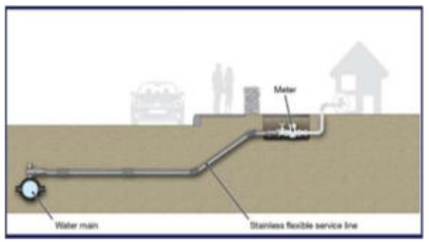












Note: (1) Project could entail analysis all of the services listed above, or discrete services as required.

Leveraging our deep industry knowledge and insights

Assess your organisation's leakage performance, benchmarked against Peers using Isle's Leakage Management Benchmarking Program

Assess your organisation's maintenance performance using Isle's Civil Maintenance Benchmarking Program

Maintenance Activities	Cost Metrics	Service Metrics
Repair of Burst Water Main; Leaking Water Main; Main Taps; Stop Tap; Water Service; and Hydrants	Labour; Materials; Plant & Equipment; Other (Traffic Management, etc); Management Overhead; Cost/Task	Response Time Repair Time Service Time Productivity (Hours/Task)

Access findings from Isle's W-LAB Program, an industry-leading innovative technologies program

W-Lab

Access knowledge from the IWA Water Loss Specialist Group, providing technical expertise in various elements of Water Losses

ASSET MANAGEMENT CUSTOMER VALUE (AMCV)

Our strategic asset management philosophy

We believe **strategic asset management**:

.. enables delivery of outcomes and services, through **physical** and **non-physical** assets (processes, people, data), that advances **business, stakeholder, and community goals**; and

.. facilitates **integration of knowledge values and rules**, and provides opportunity for **resilience, economic circularity and flexibility in decision making**

Our strategic asset management service offerings

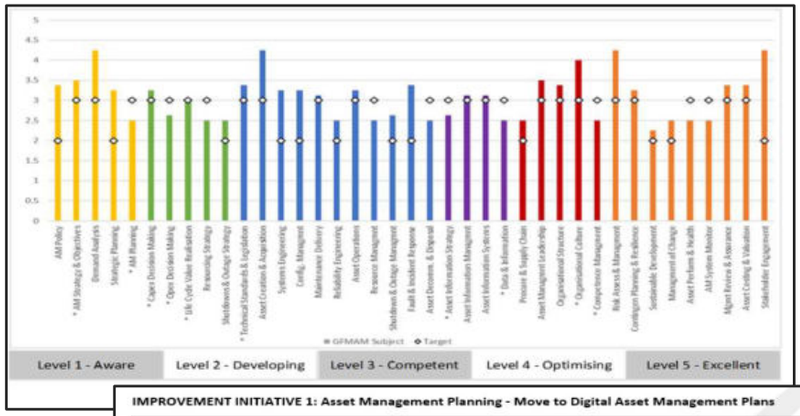
Structure & Operating Model	Isle has an extensive repository of asset management structures, position descriptions and operating models that can be accessed to support improved asset management leadership and governance within your organisation.
Process Optimisation	Our repository of asset management processes covering the entire asset life cycle (i.e. from asset creation through to asset replacement) can be used to better define accountabilities and streamline delivery of your asset management processes.
Innovation & Technology Scans	Isle has an extensive water innovation & technology ecosystem supporting asset management decision making, which consists of 6,000+ technologies and over 200 water utilities across 11 different countries.
Benchmarking	Our asset management benchmarking is based on the International Asset Management (IAM) Conceptual AM Model and the associated Global Forum in Maintenance and Asset Management (GFMAM) & ISO55000 guidelines & principles.
Capacity Building	Isle help our clients build capacity, and create asset management career pathways within their organisation, by provision of professional AM training, and facilitation of design-thinking forums, through experienced and qualified trainers & facilitators.

Service offering – benchmarking

Delivery of AM Benchmarking Programs involving Multiple or Singular Participants

Assessment against the IAM Conceptual AM Model

Rating Against 39 Subject Areas



Improvement Initiatives to Close Gaps in Performance

IMPROVEMENT INITIATIVE 1: Asset Management Planning - Move to Digital Asset Management Plans

Background	Indicative Business Benefits
The Utility has completed development of its strategic asset management plan (SAMP) and commenced development of asset management plans (AMPs). The AMPs have been developed for 2-3 asset classes, with remainder (around 30 total) planned to be completed. The AM Planning hierarchy and structure requires improvement/overhaul, to allow; • Seamless and efficient development of AMPs for remaining asset classes (majority) • Move to development of 'Digital AMPs'	• Fast track development of backlog AMPs • Ensure AMPs become dynamic rather static in nature with direct link to live data • AMPs become a decision-making tool, rather than a document/report • Organisation leaps into new state of the art AM planning with Digital AMPs
Linkage with Executives Top 10 Priorities	**Timeframes**
Initiative directly links to Subject 5 (Asset Management Planning)	Total 6 Month elapsed time
Preliminary Scope	**Estimate of Resources Required**
• Obtain AM Steering Committee approval on definition of 'Asset Classes' and agree common consensus (if not already in place) • Revise / Develop new AM Planning hierarchy. Suggested logic may include: I. SAMPs to contain strategic information and guidance applicable to all asset types/categories. For instance, Renewal Models, Performance Reporting (KPIS) and other logic to be guided by SAMP but prescribed at AMP and Asset Class Plan (ACP) level, relevant to the asset class II. AMPs to directly link and integrate with SAMPs and prescribed strategies and business directive III. Asset Class Plans to directly link and integrate with AMPs and prescribed structure. The organisations state of the assets report (SOTAR), currently in development, to be linked directly to the ACPs. Effectively the SOTAR will become the ACP, as it evolves to also include the voice of the customer.	• Actual resourcing requirements should be determined by the Utility and are dependent on degree of executive support, utility size, asset management and operational culture, willingness to change and utility improvement priorities. • Indicative resource estimate is 1 FTE for 3-6 months

- Isle's asset management practitioners have detailed knowledge of the *IAM Conceptual AM Model* and the associated *Global Forum in Maintenance and Asset Management (GFMAM) and ISO55000 assessment guidelines & principles*

AMCV 2020 participants

www.isleutilities.com

ANNEXES AND ADDITIONAL INFORMATION

ABOUT ISLE UTILITIES

We bring innovation and technology to life

Connecting expertise, investment and inspired ideas.

IDENTIFYING CHALLENGES

We collaborate with the world's leading utilities and technology end users. After establishing their challenges, we find solutions through the independent sourcing of innovative technologies.

CONNECTING TECHNOLOGIES

We provide market intelligence to technology providers, enhancing the commercialization process through increased dialogue and understanding of prospective clients' needs.

COLLABORATIVE EVALUATION

Our Innovation Forums collaboratively review emerging technologies in a peer-to-peer environment increasing opportunities for knowledge transfer and shared resources to support the uptake of technology.

SECURING EXTERNAL INVESTMENT

We connect the right technologies to the right investors, and provide support through technical and market due diligence.

ONLINE TOOLS

Our online tools provide an accessible platform to showcase qualified emerging solutions and best practices to a global network of end users. Our independent webinars showcase step-change water technologies from around the world.

INDUSTRY EVENTS

Our network of technologies, investors and end users enable us to deliver high-octane innovation pavilions, showcasing the world's most exciting technologies at key global conferences.

Our Innovation Ecosystem – Europe

Our Innovation Ecosystem – United States of America

Our Innovation Ecosystem – Asia-Pacific

OUR LEAKAGE MANAGEMENT BENCHMARKING PROGRAM

Program referees

‘We already undertake national benchmarking around leakage as part of our normal regulatory reporting cycle. However, what makes this project different is the international dimension. Involving utilities from the UK, Australia and Latin America has brought a fresh perspective to traditional benchmarking, especially when we share openly. By working together to identify best practice, all of the utilities involved will improve the service they offer to their customers. This was a really good piece of work and has really driven a change in mindset into Thames Water’s approach to backlog and speed of repair.’

Tim McMahon, Head of Water Asset Management, Thames Water (UNITED KINGDOM)

‘Several of us within the water industry had already identified the need to undertake a detailed evaluation of leakage management, particularly in relation to the way we calculate our water balances. I’m certain we have gained important insights from the implementation of new technologies that complement the many years’ experience gained managing leakage at a holistic and tactical level. Isle’s Leakage Management Program offering was exactly what we searching for, in terms of a balance between strategic insight and in-depth analysis. Urban Utilities are really excited about the learnings we’ve gained from this program.’

Simon Taylor, Manager Infrastructure Planning, Urban Utilities (AUSTRALIA)

1. Non-Revenue Water Balance

Comparison of your organisation to the peer group

Review of Non-Revenue Water Balance

Overall

- Infrastructure Leakage Index (ILI)
- Bulk water pricing
- Key components of NRW Balance
- Adoption of IWA assumptions versus bottom-up calculations
- Your strengths and challenges
- Recommendations for your performance improvement

Unbilled Authorised Consumption

- Proportion of NRW
- Unmetered operational use
- Mains flushing techniques

Apparent Losses

- Proportion of NRW
- Theft
- Meter penetration
- Meter technology type
- Meter inaccuracies
- Data handling

Real Losses

- Proportion of NRW
- Storage losses
- Transmission losses
- Distribution losses
- Service Connections losses

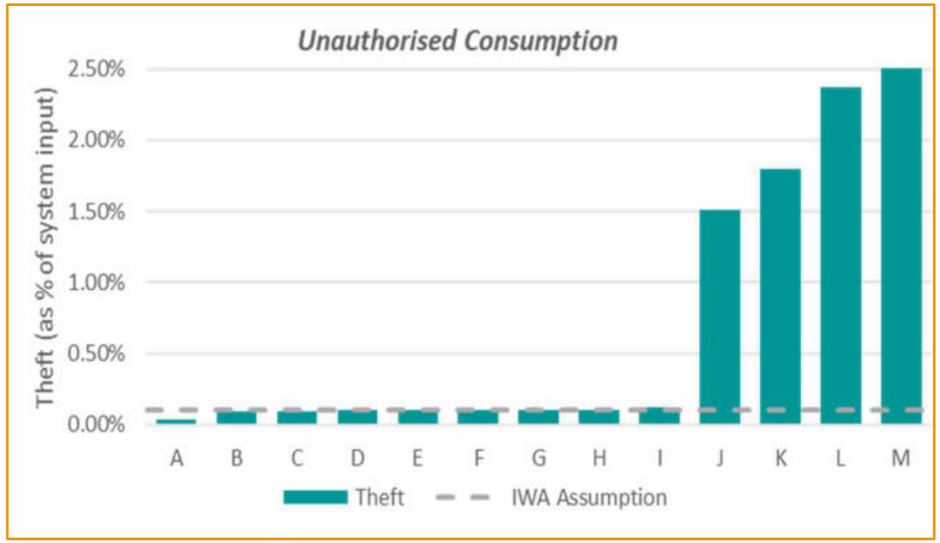
1. Non-Revenue Water Balance

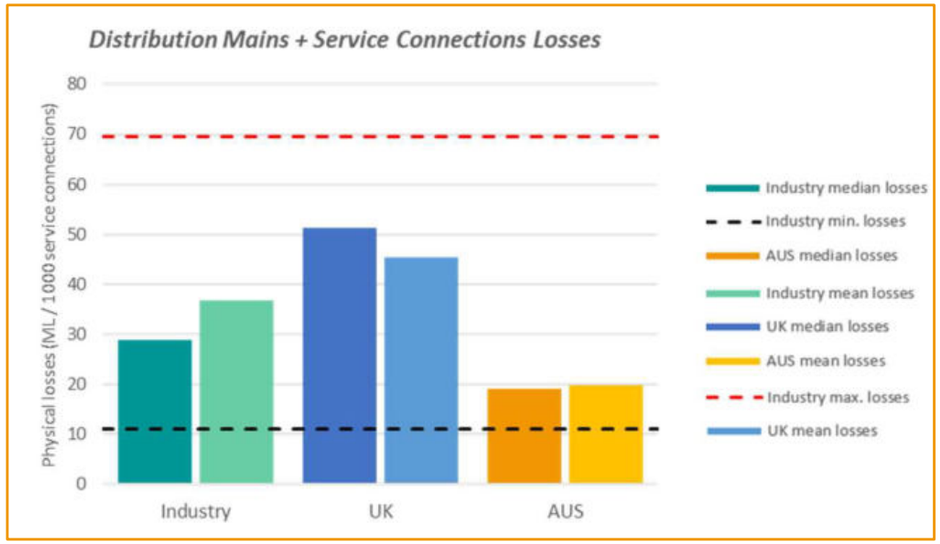
Learn about key themes to date

Varying levels of confidence in the accuracy of NRW values for Unbilled Authorised Consumption and Unauthorised Consumption. Most **Australian utilities used IWA assumptions whilst UK utilities used internally developed figures** (due to regulatory reporting requirements).

Varying levels of confidence in the apportioning of Real Losses across asset classes (e.g. transmission mains, distribution mains, service connections), ranging through applying basic ratios across asset classes, through to detailed bottom-up analysis using BABE concepts.

Common challenges in understanding NRW components in real time. A key issue being the high cost/difficulty in monitoring all forms of water loss (e.g. operational use, theft).





2. Leakage Management Pillars

Comparison of your organisation to the peer group

Review of Leakage Management Pillars

Overall

- TOTEX per property per leakage pillar
- CAPEX per property per leakage pillar
- TOTEX versus retail price
- Your strengths and challenges
- Recommendations for your performance improvement

Pressure Management

- System pressure differential
- PRV and DMA density
- PRV technology type
- PRV inspections and maintenance rate

Active Leakage Control

- Leakage detection technique and technology type:
  - Transmission
  - Distribution
  - Service Connections
- Leakage events per property
- Customer reported events per property

Speed & Quality

- Speed and quality of repairs:
  - Transmission
  - Distribution
  - Service Connections

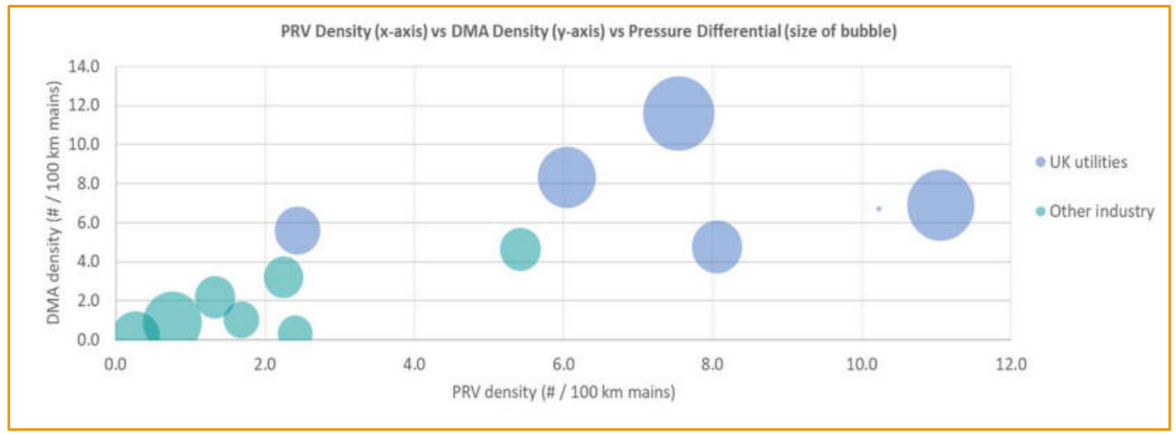
Asset Management

- Pipe material type and age:
  - Transmission
  - Distribution
  - Service Connections
- Distribution mains replacement rate per property

2. Leakage Management Pillars

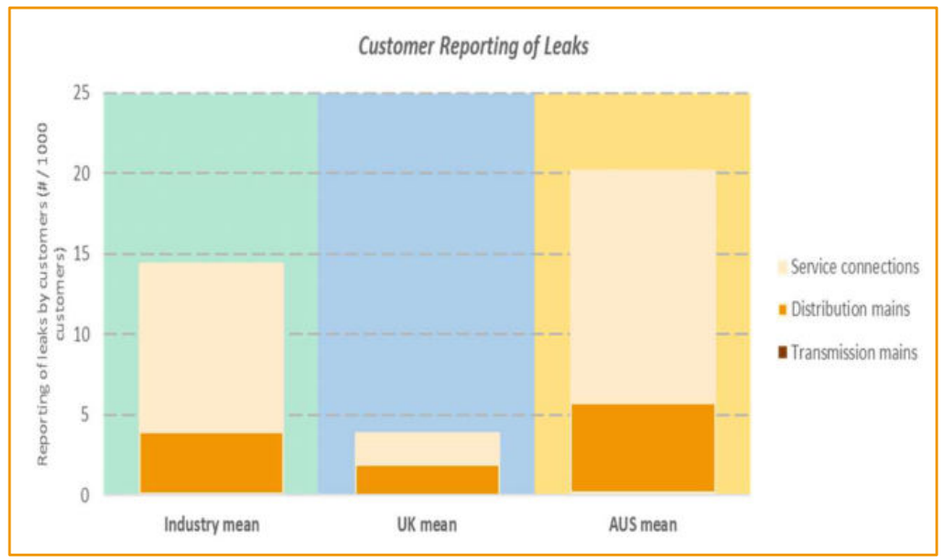
Learn about key themes to date (1/2)

The **UK utilities have a significantly higher density of PRVs and DMAs** per length of main relative to Australian utilities.



Fixed-outlet PRVs are the most common technology approach across the peer group, although **some UK utilities are investing in higher levels of technology, including remote-controlled pressure modulation.**

Australian utilities have much higher levels of customer reporting of leaks than in the UK, with the majority of leaks identified in Australia being reported by customers.



In contrast, **UK utilities have begun investing in large quantities of fixed-in-place acoustic sensors and other sensors** to provide constant measurement, monitoring, and to a lesser degree, modelling of leaks.

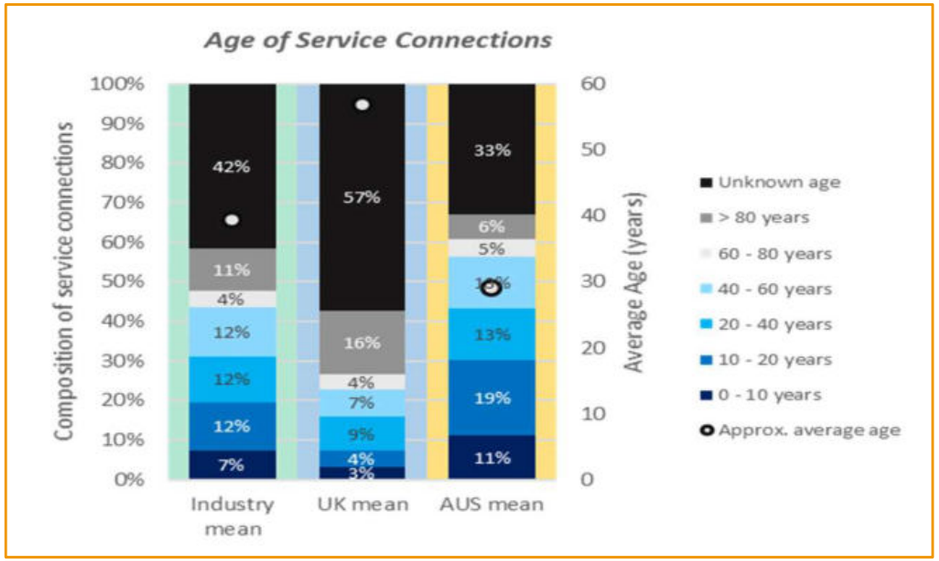
2. Leakage Management Pillars

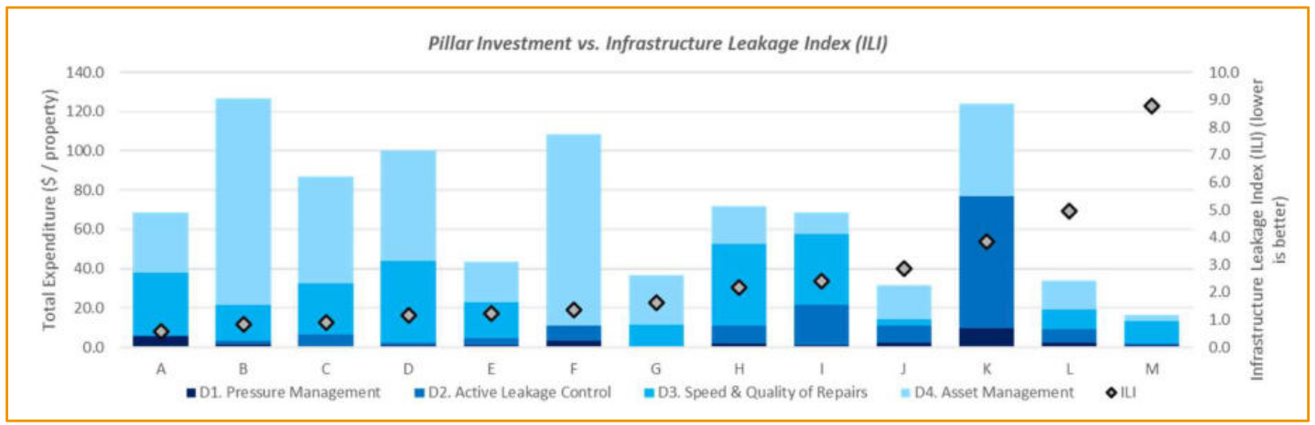
Learn about key themes to date (2/2)

Many Australian utilities have a strong focus on decreasing response and repair times, investing in their response crews and establishing focused KPI frameworks with insourced and outsourced workforces.

Significant data gaps were observed for service connections across all participants (age and material). Some utilities are working to progressively addressing these data gaps in light of high real losses in these assets.

Australian utilities have a higher investment focus in asset management (including water main renewals) than UK participants, which is generally supported by higher retail pricing.





3. Leading Practices Compendium

Access to many leading practices across leakage management

	Ref.	Practice Name
UNBILLED AUTHORISED CONSUMPTION	UAC1	Bottom-up Estimation of Fire Services Volumes (AUS)
	UAC2	Bottom-up Estimation of Fire Services Volumes (UK)
	UAC3	Neutral Output – Discharge Elimination System (NO-DES) Mains Flushing
	UAC4	Air Scouring of Water Mains
APPARENT LOSSES	AL1	Approximating Unauthorised Consumption in Favelas
	AL2	Smart Stand Pipes
	AL3	Digital Metering Trials (AUS1)
	AL4	Digital Metering Trials (AUS2)
	AL5	WRC Meter Under-Registration Tool
	AL6	Prioritisation of Meter Replacement Strategies
	AL7	Automated Billing Exceptions Management
	AL8	Integrated Billing Exception Management
REAL LOSSES	RL1	UK Approach to the NRW Calculation
	RL2	Burst and Background Estimates (BABE) Model
	RL3	Real Losses Distribution in Water Supply Networks
	RL4	Customer-Side Leakage

	Ref.	Practice Name
PRESSURE MANAGEMENT	PM1	Sub-zonal Pressure Management
	PM2	Remote-controlled Pressure Management
	PM3	Advanced Pressure Management Control
	PM4	PRV Field Inspection and Maintenance
	PM5	Risk-based PRV Inspection Programs
ACTIVE LEAKAGE CONTROL	ALC1	Annual Leak Field Survey Program
	ALC2	Leak Prevention through Acoustic Monitoring
	ALC3	Acoustic Loggers for Leak Detection
	ALC4	Smart Water Networks for Leak Detection
	ALC5	Leak Detection Dogs
	ALC6	“Love Water” Campaign for Water Conservation
	ALC7	Customer Hub: Towards an Enhanced Customer Experience
	ALC8	Community Education and Social Media Tools
SPEED & QUALITY OF REPAIRS	SQ1	Speed & Quality of Repairs in Limited Access Environments
	SQ2	Inter-authority & Traffic Management Agreements
	SQ3	Optimised Contract Management & Leakage Prioritisation
PIPELINE & ASSETS MANAGEMENT	AM1	Service Pipe Register Enhancement
	AM2	Performance Analysis for Service Renewal Decision-Making
	AM3	Asset Risk Modelling for Mains Renewals
	AM4	DMA Fingerprinting for Asset Management

3. Leading Practices Compendium

Detailed leading practice write-ups with specific utility contacts

Network:	Company X	Services:	Water/wastewater, retailer	Connections:	~260k	SIV:	~66GL

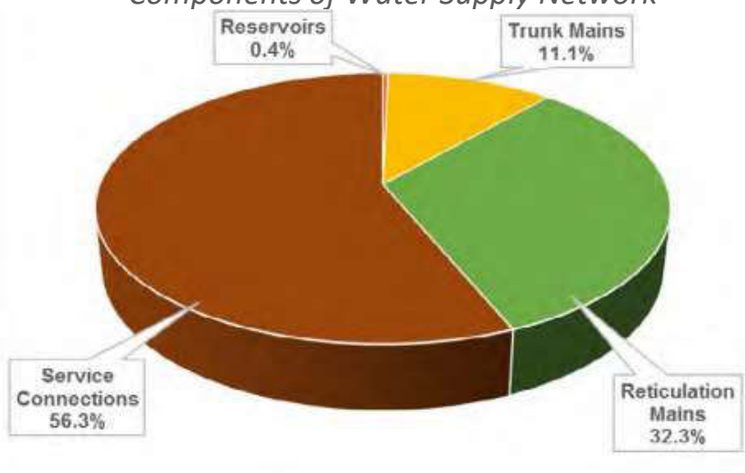
About:

Traditionally, water utilities have used rough estimates for determining how their Real Losses are distributed across their assets (e.g. using industry-standard distributions, or estimating a distribution based on length of mains and/or burst rates). However, the distribution of Real Losses across different assets is dependent on a large number of variables and can vary significantly between utilities.

Company X undertook a bottom-up analysis of leakage across their assets (reservoirs, trunk mains, distribution mains, and service connections), where leakage was classed as: (1) reported leakage (i.e. visible leaks reported to the utility); (2) unreported leakage (i.e. detectable only by active leak detection (ALD); and (3) background leakage (small, undetectable leakage that persists until it worsens to the point of being detectable by ALD).

Company X ensured that operational crews were recording the estimated reported leakage and set out to determine the level of unreported leakage using significant levels of ALD. The results of this significantly changed Unitywater's understanding of which assets contributed the most to Real Losses. E.g. Distribution mains contribute 44% of reported leakage by volume but only 32% of leakage volume in the bottom-up analysis (see **Figure**).

Figure: *Company X Real Losses from Various Components of Water Supply Network*



Benefits:

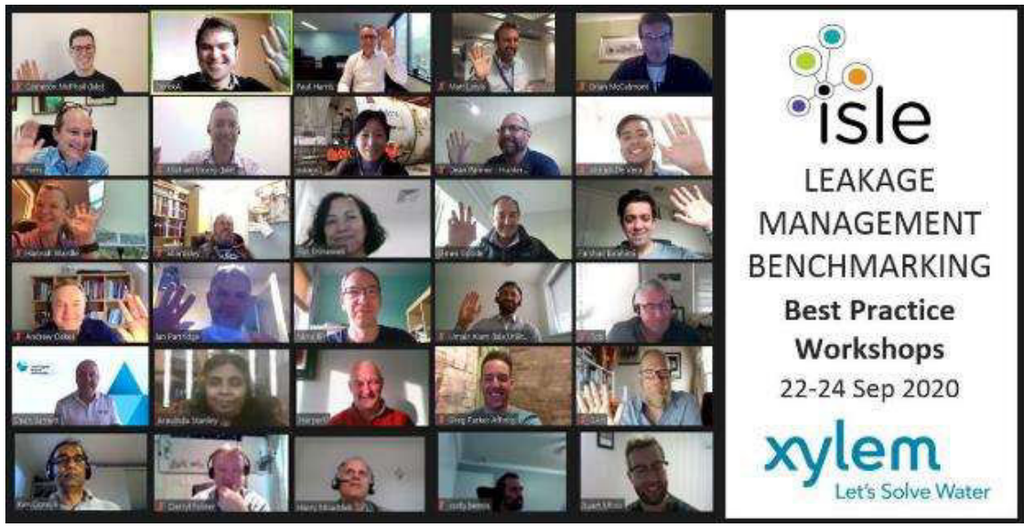
- Improved understanding of where Real Losses are occurring. This is due to better information about smaller leaks rather than using industry-generalised assumptions of where losses are occurring or only using reported leakage.
- Greater understanding of the water supply network to help inform utilities in their leakage management decision-making.

Considerations:

Significant active leak detection is required across the majority of the network in order to determine an accurate estimate of unreported leakage.

4. Best Practice Workshop

Knowledge sharing and networking via our Best Practice Workshop



- Key study findings and industry themes
- Best practice presentations by utilities
- Agree and plan industry improvement initiatives and timelines, and assign responsibilities to Government, Utility Owners, Utilities, Regulators and Customers

Presentation of industry trends and findings

Presentations from industry leading utilities and partners

Focused discussion on improvement opportunities

Networking and professional development opportunities

Our collaborative program approach over six (6) steps

Step 1:

Kick-off session

Isle to brief utility data collection team members on the project approach and how to complete the data pack (either in person or via teleconference).

Step led by: Isle

Step 2:

Complete data pack (draft submission)

Utility project team members complete the draft version of the datapack. Isle will make our global team available to the utility to support/clarify questions as required.
Step led by: Utility

Step 3:

Data validation (final submission)

Isle undertakes an initial high-level of analysis of the data collected to identify inconsistencies and potential incorrect data responses. The utility provides the final version of their datapack.
Step led by: Isle

Step 4:

Practice interviews

Isle undertakes on-site practice interviews to determine the cause of performance gaps, to agree priority utility improvement activities and identify industry best practices.
Step led by: Isle

Step 5:

Report generation

Confirmed metrics, performance gaps, utility improvement initiatives and identified industry best practices are written into a Final Utility Report.

Step led by: Isle

Step 6:

Best Practice Workshop

Isle facilitate a Best Practices Workshop, where those exhibiting best practice showcase these. The workshop is also used to agree industry improvement initiatives and timelines.
Step led by: Isle

Program outcomes tailored to provide guidance and value

Step 1:

Kick-off session

Isle Deliverable/s:

- Orientation notes, including metric definitions
- Datapack
- Joint face-to-face or web-based teleconference orientation session.

Step 2:

Complete datapack (draft submission)

Isle Deliverable/s:

- Provide remote support during data collection period.

Step 3:

Data validation (final submission)

Isle Deliverable/s:

- Preliminary charting of performance
- Individual web-based teleconference session to discuss preliminary results and agree changes to submitted data.

Step 4:

Practice interviews

Isle Deliverable/s:

- Individual web-based or face-to-face practice interviews.

Step 5:

Report generation

Isle Deliverable/s:

- Draft Utility Report of findings and utility-specific improvements
- Final Utility Report of findings and utility-specific improvements.

Step 6:

Best Practice Workshop

Isle Deliverable/s:

- Facilitated Best Practice Workshop (either web-based or face-to-face)
- Brief Report on outcomes of workshop (i.e. key themes, industry initiatives).

NRW MANAGEMENT PLANNING

Non-Revenue Water Balance

Review of your approach to calculating the International Water Association (IWA) Non-Revenue Water Balance

<table>
<tr><td rowspan="6">System Input Volume</td><td rowspan="3">Authorised Consumption</td><td rowspan="2">Billed Authorised Consumption</td><td>Billed Metered Consumption</td><td rowspan="2">Revenue Water</td></tr>
<tr><td>Billed Unmetered Consumption</td></tr>
<tr><td rowspan="2">Unbilled Authorised Consumption</td><td>Unbilled Metered Consumption</td><td rowspan="5">Non Revenue Water</td></tr>
<tr><td>Unbilled Unmetered Consumption</td></tr>
<tr><td rowspan="3">Water Losses</td><td rowspan="2">Apparent Losses</td><td>Unauthorised Consumption</td></tr>
<tr><td>Meter Under-registration</td></tr>
<tr><td>Real Losses</td><td>Leakage on Transmission and Distribution Mains
Leakage and Overflows at Storage Tanks
Leakage on Service Connections</td></tr>
</table>

Source: Lambert, A 2003. Assessing non-revenue water and its components: a practical approach. Water21: 50-51. August 2003.

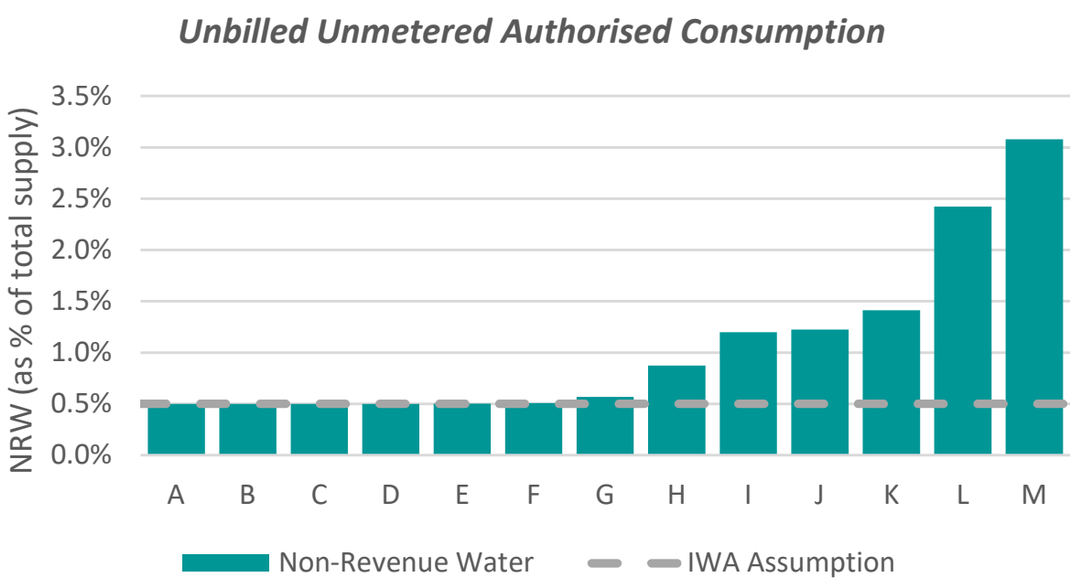
Unbilled Authorised and Unauthorised Consumption

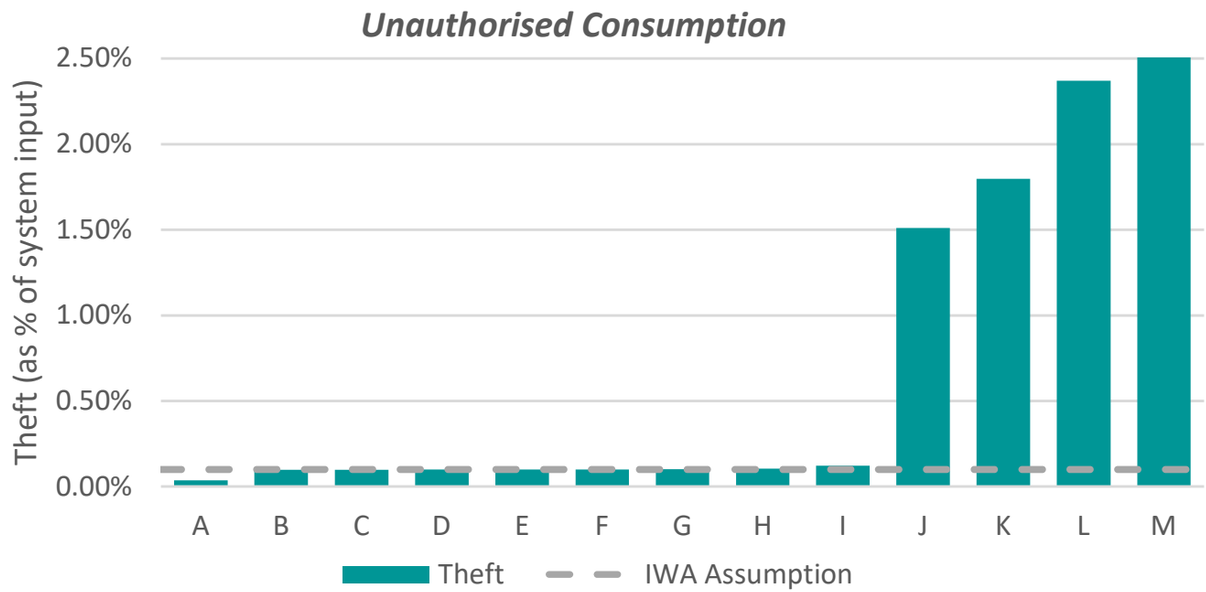
Our Approach

- Determine whether and how your organisation typically uses the value of 0.5% recommended by the IWA.
- A review undertaken of any estimates already completed.
- Review utility estimates against a benchmarked cohort.
- Recommendations on how to improve these estimates moving forward.

Your Benefit

- Gain an understanding of how Unbilled Authorised and Unauthorised Consumption affects the NRW Water Balance and recommendations on how the estimates could be improved.





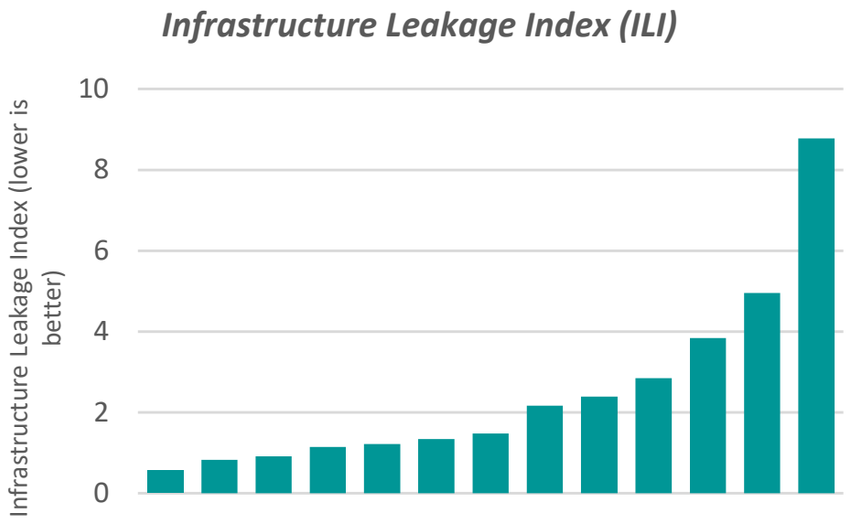
Real Losses

Our Approach

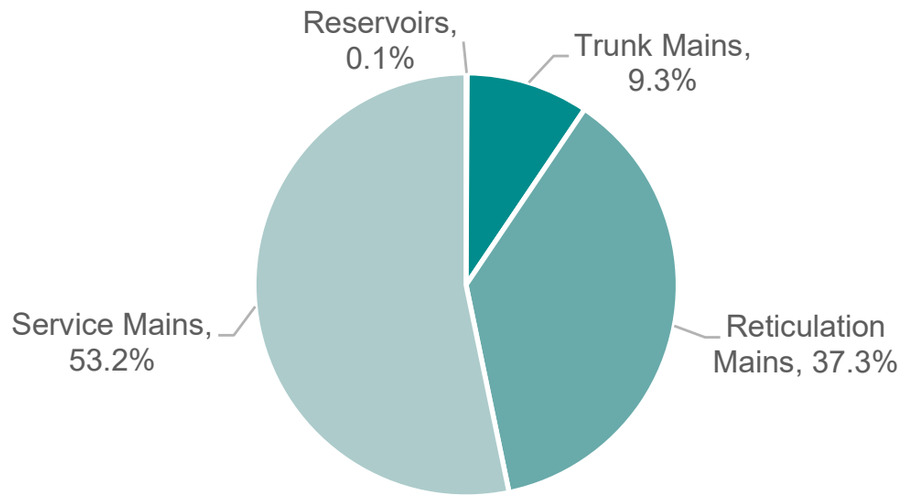
- Determine breakdown of NRW, including the proportion of Real Losses (often the highest component).
- Further breakdown Real Losses into losses from Reservoirs, Transmission Mains, Reticulation Mains and Service Pipes. This breakdown will be assessed with a determination of which component of Real Losses is the highest, allowing targeted asset and maintenance planning.
- The Infrastructure Leakage Index (ILI) is another key indicator of the performance of a utility, in terms of managing its Real Losses. A calculation of ILI will be made and a review of its value made.

Your Benefit

- Gain an understanding of the breakdown of Real Losses, along with an accurate calculation of ILI, to help develop a plan of real loss management.



An assessment of your ILI against your peers



The split between real loss components can vary from utility to utility

DMA Reporting

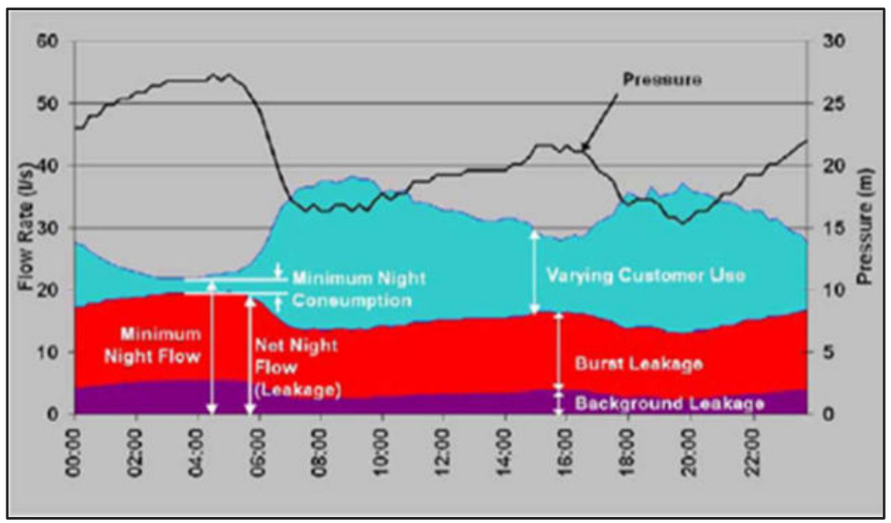
DMA Reporting

Our Approach

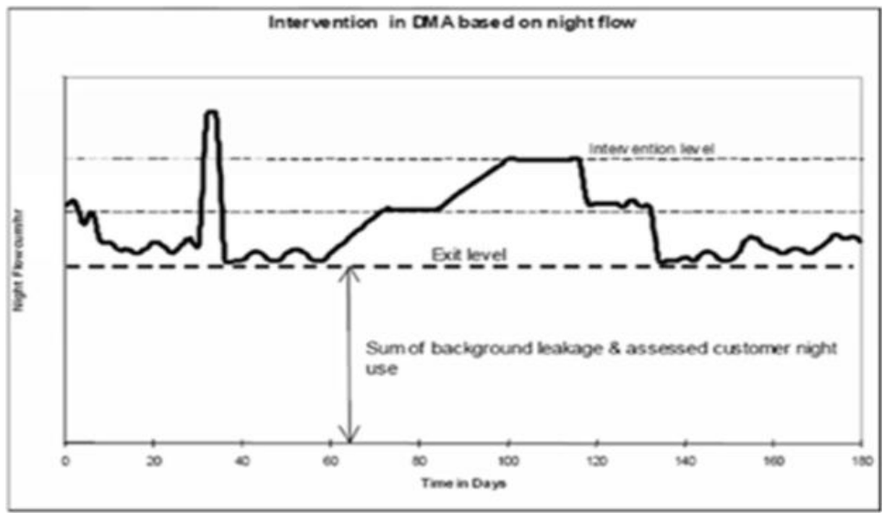
- Review the current DMA monitoring system and how NRW and leakage is reported.
- Assess the methodology for estimating the Legitimate Night Flow within each DMA.
- Review the Net Night Flows across the DMAs and the target points that trigger Active Leak Detection activities.
- Undertake a bottom up analysis of all DMAs to calculate the total leakage volume and using this figure to estimate the leakage volume in the remaining reticulation pipework.

Your Benefit

- Understand how effective your DMA management is, and if leakage levels are being effectively being identified and acted upon.



Minimum Night Flow in a DMA (IWA Water Loss Task Force, 2007)



Intervention Level Based on MNF (IWA Water Loss Task Force, 2003)

Active Leakage Detection

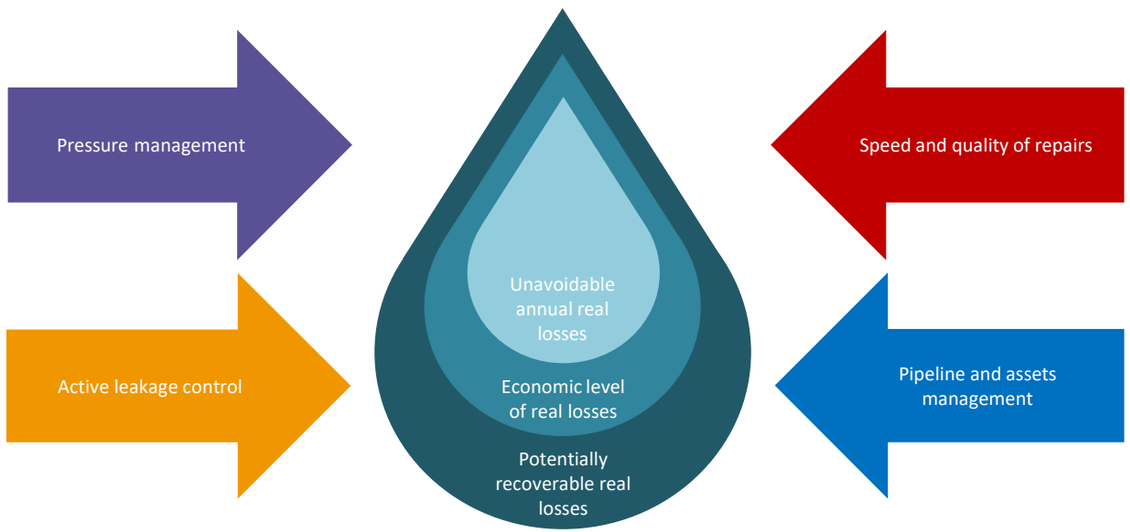
Active Leakage Detection

Our Approach

- Based on the analysis undertaken on the DMA night flows, assess the effectiveness of the current ALD program on reticulation mains.
- Review existing or develop new Economic Level of Leakage calculations to assess whether leakage targets are cost beneficial.
- Assess whether trunk main leakage is an issue, whether it is being currently addressed and make recommendations on improving trunk main leakage detection.

Your Benefit

- Understand the effectiveness of the ongoing Active Leak Detection activities, and whether these need to be adjusted to meet the economic level targets.



The four pillars of managing real losses, potentially down to Economic Levels

Typical reticulation main leak

Pressure Management

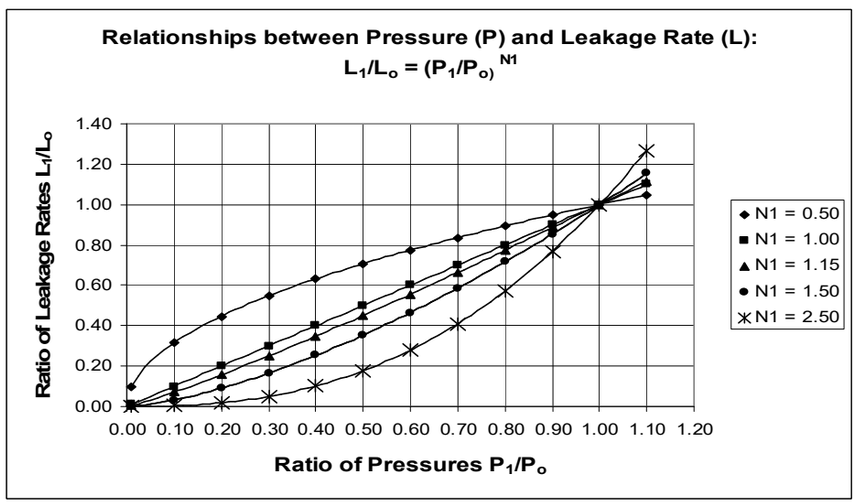
Pressure Management

Our Approach

- Assessing the current DMA Critical / Minimum Pressure Point monitoring procedures.
- Reviewing existing installed PRVs, with regard to their performance and potential efficiency improvements.
- Assess existing N1 calculations and/or undertake the development of N1 calculations.
- Assessing the cost benefits for flow modulation of PRVs, either basic through flow monitoring at the PRV, or more advanced through communication with a Critical / Minimum pressure sensor.
- Evaluating the fire flow specifications and subsequent pressure requirements.

Your Benefit

- Gain understanding of how effective pressure management could be on reducing your leakage volumes, identify potential fire flow limitations and assess how effective Advanced Pressure Management could be on your network.



Development of N1 Values, enabling savings in leakage volume to be assessed

Fire fighting requirements critical to pressure management

Meter Replacement

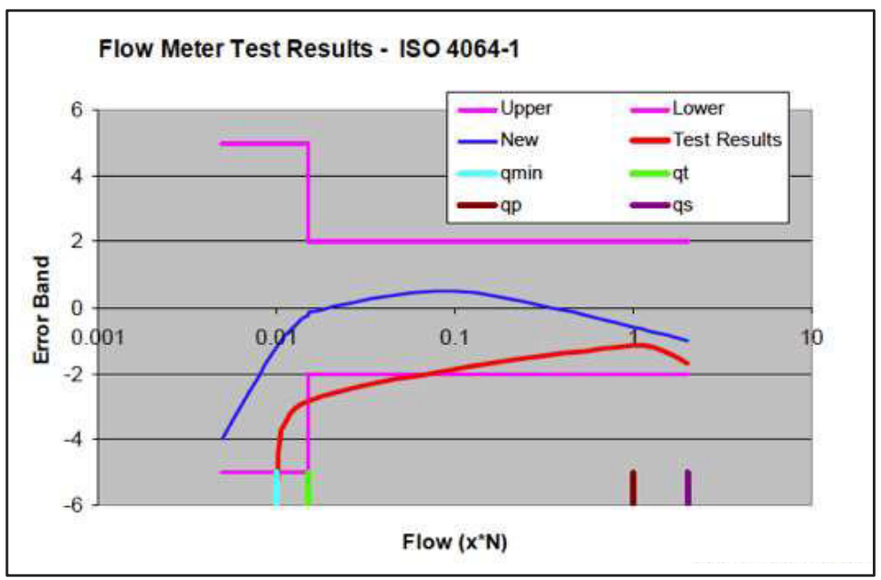
Meter Replacement

Our Approach

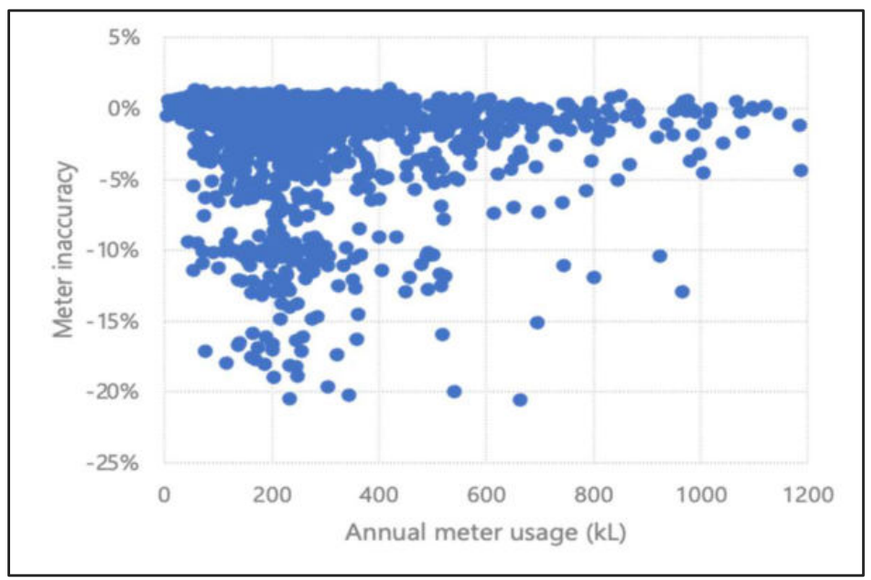
- Evaluate the current meter testing programme and identify whether any improvements can be made.
- Undertake a cost-benefit analysis of any current meter replacement plans.
- Evaluate what meters are available on the market and identify the pros and cons of each.
- Evaluate the top customers and assess the performance of their meters and the potential for meter replacement.

Your Benefit

- Understand how accurate the current meter fleet is, and the effectiveness of the current meter replacement programme in terms of replacement age and type of meter.



Accuracy of customer meters is dependent on age and flowrate (Alex Rizzo)



Results of meter inaccuracy vs annual meter usage

Response Time

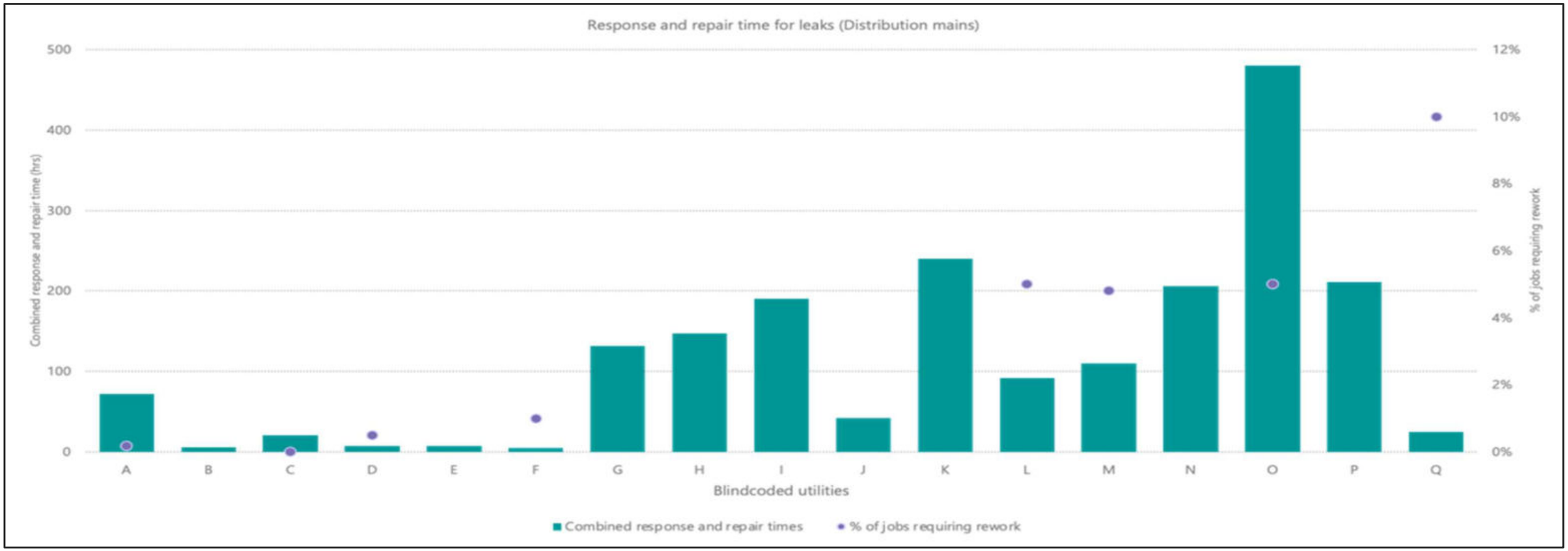
Response Time

Our Approach

- Review the procedure for receiving reported leaks and subsequent repair activities.
- Review the current response priority matrix, to assess its efficiency in loss reduction.
- Analyse the reported leak and repair response data.

Your Benefit

- Understand how current repair response times compare to Peers, and whether improvements to times could lower real losses.



Digitalisation

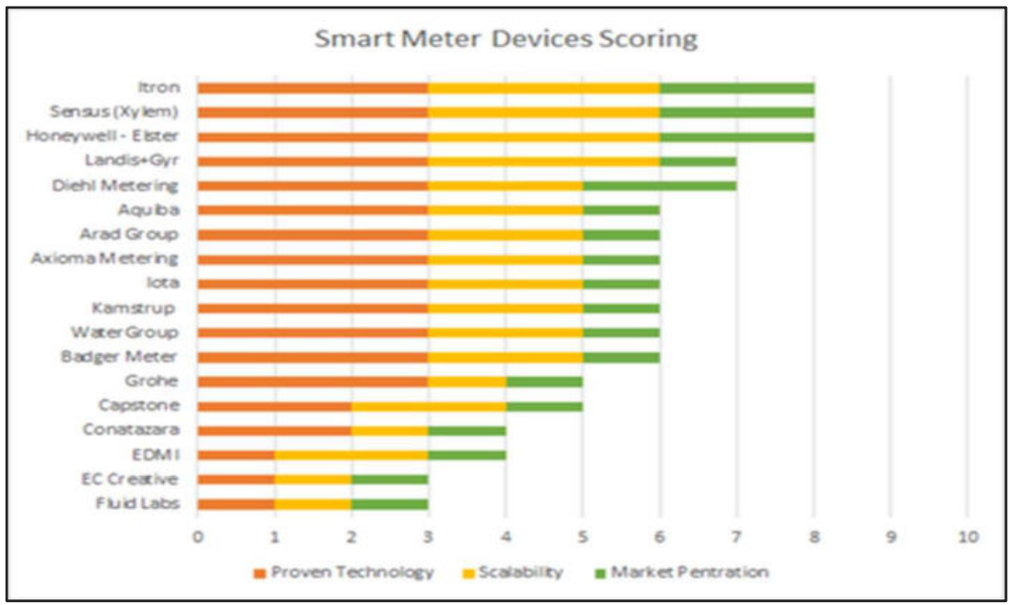
Digitalisation

Our Approach

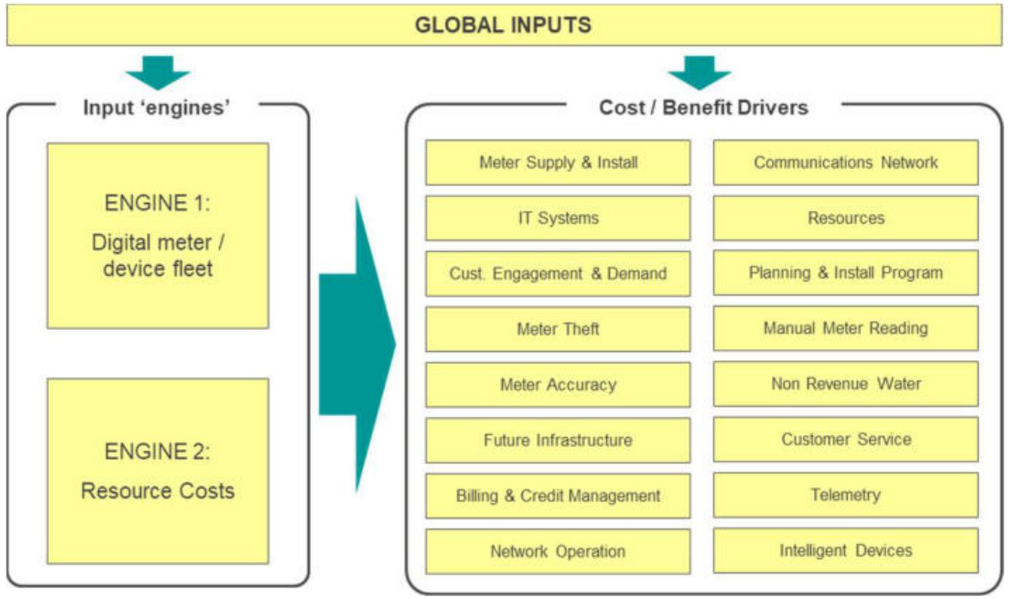
- Review and identify digital technology applicable to your organisation's leakage management, including meters and sensors.
- Identifying communication networks suitable within your organisation's service area.
- Review the cost-benefits for undertaking a rollout of digital leakage technology at network scale.
- Develop scope for Digital Technology Pilot projects.

Your Benefit

- Identify potential digitalisation technologies (2), the economic business case for a full technology rollout (2), and gain a Digital Project Pilot Plan (2).



Digital technology assessment



Economic Modelling and Business Case development

Note: (2) Digitalisation elements already developed / implemented by your organisation would be fully reviewed by Isle.

Bulk Metering

Bulk Metering

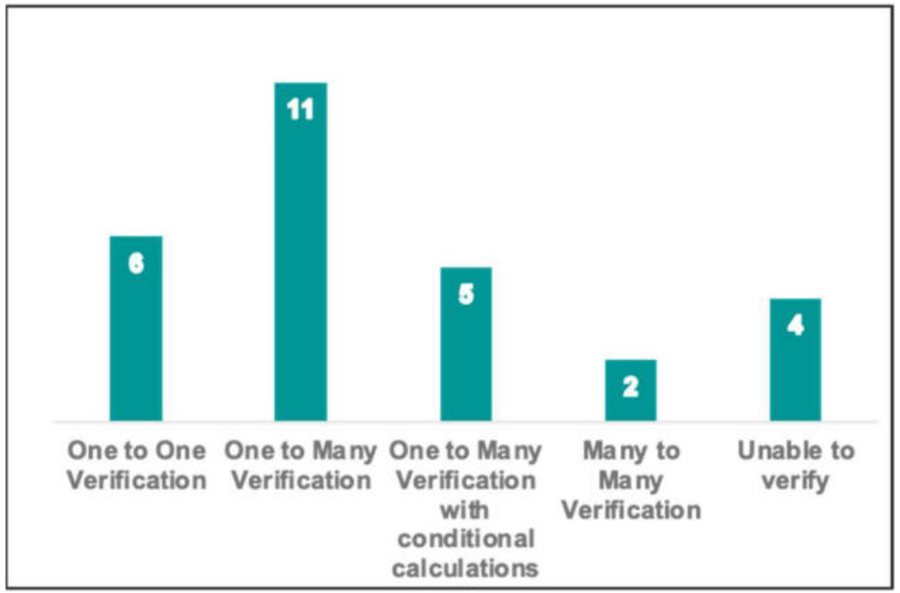
Our Approach

- Evaluate your existing Bulk Meters, looking at type, age and verification history.
- Assess the effectiveness of Bulk Meter verification, if from a third party supplier.
- Evaluate any existing Flow Balance system, to assess the volumetric flows from bulk suppliers.

Your Benefit

- Understand the accuracy of system input volumes and their impact on NRW volumes.

Yearly electronic verification of Bulk Meters



Flow balancing to verify volumetric flows

Asset Management

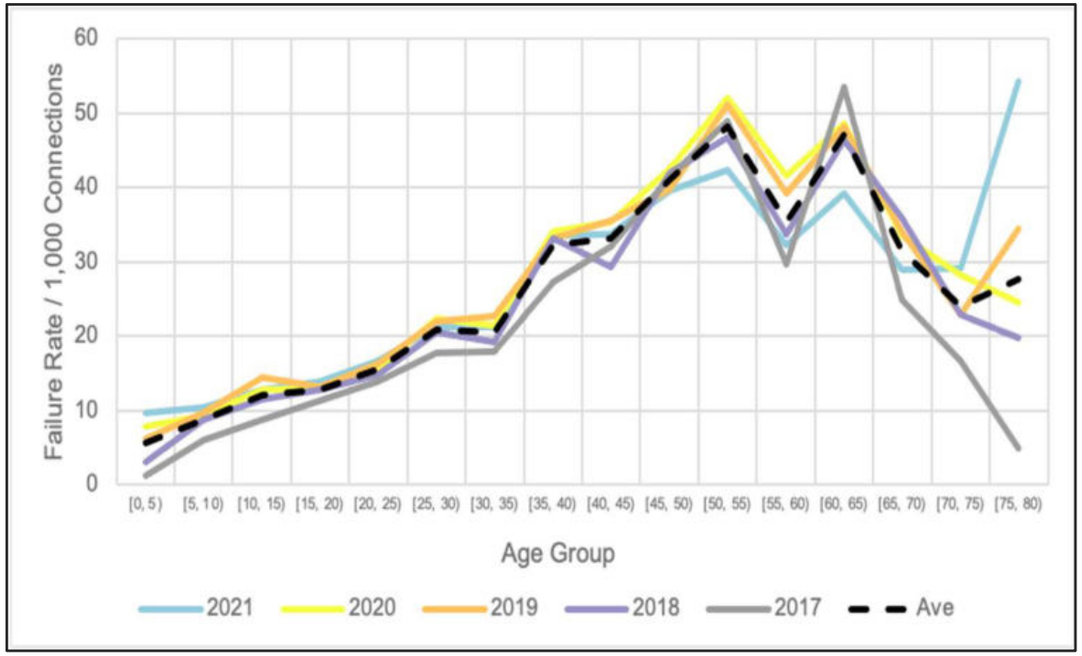
Asset Management

Our Approach

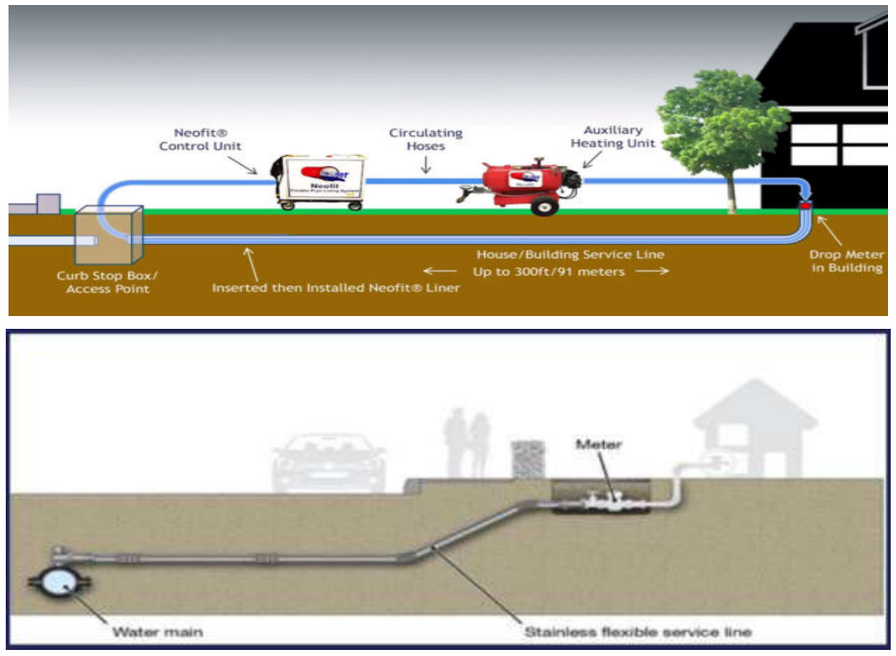
- Review the bottom-up Water Balance analysis to evaluate service and reticulation pipe leakage performance.
- Review the current service connection material in installation specifications and make recommendations if required.
- Evaluate the cost-benefit of various no-dig and other technologies.
- Evaluate the cost-benefit of pipe replacement vs leak repair.

Your Benefit

- Understanding of the effectiveness of your current pipe replacement plans, and the cost benefit of no dig technologies for mains replacement and rehabilitation.



Failure rate of service pipes to age

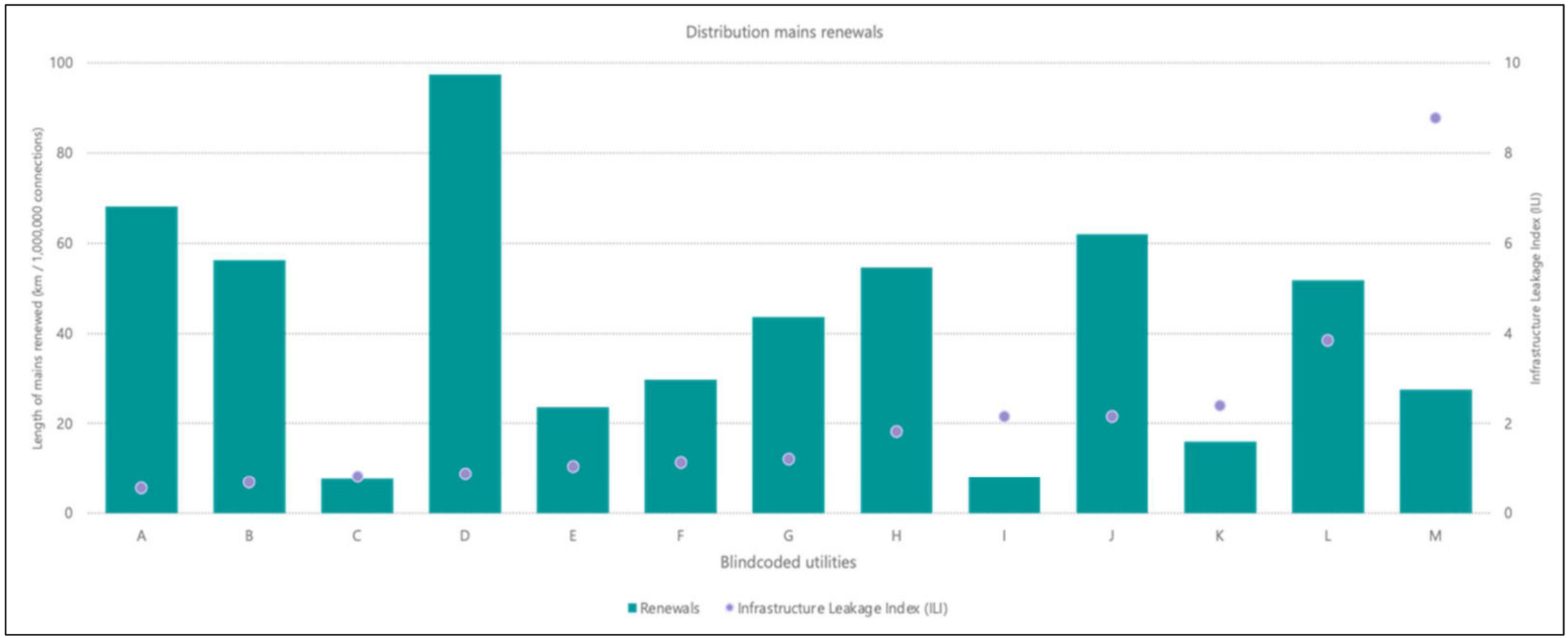


Evaluate various service pipe replacement materials and technologies

Asset Management

Your Benefit (cont'd)

- Understand how your mains replacement and rehabilitation activities affect leakage volumes and ILI as a whole.



Reporting

NRW Management Plan

Your Benefit

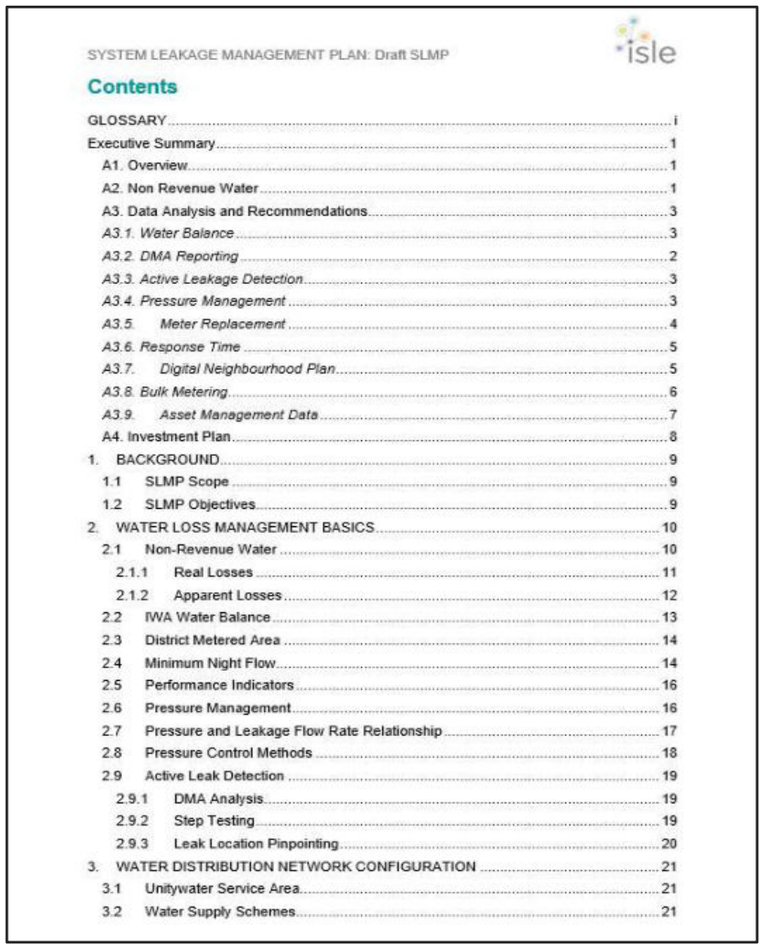
- Detailed plan covering the basics of NRW, current network configuration, current NRW and including detailed analysis with recommendations.

System Leakage Management Plan

Draft SLMP

31 August 2021

isle



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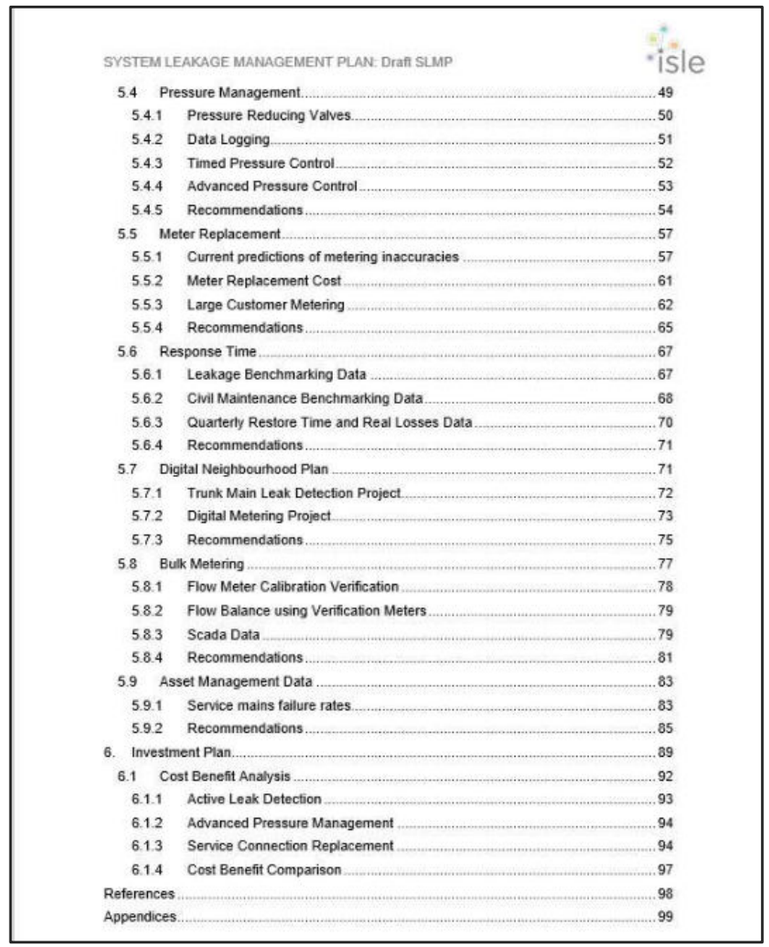
Contents



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10 Year Investment Plan

Your Benefit

- Detailed 10 Year Investment Plan showing additional investment needed to meet recommended leakage target.

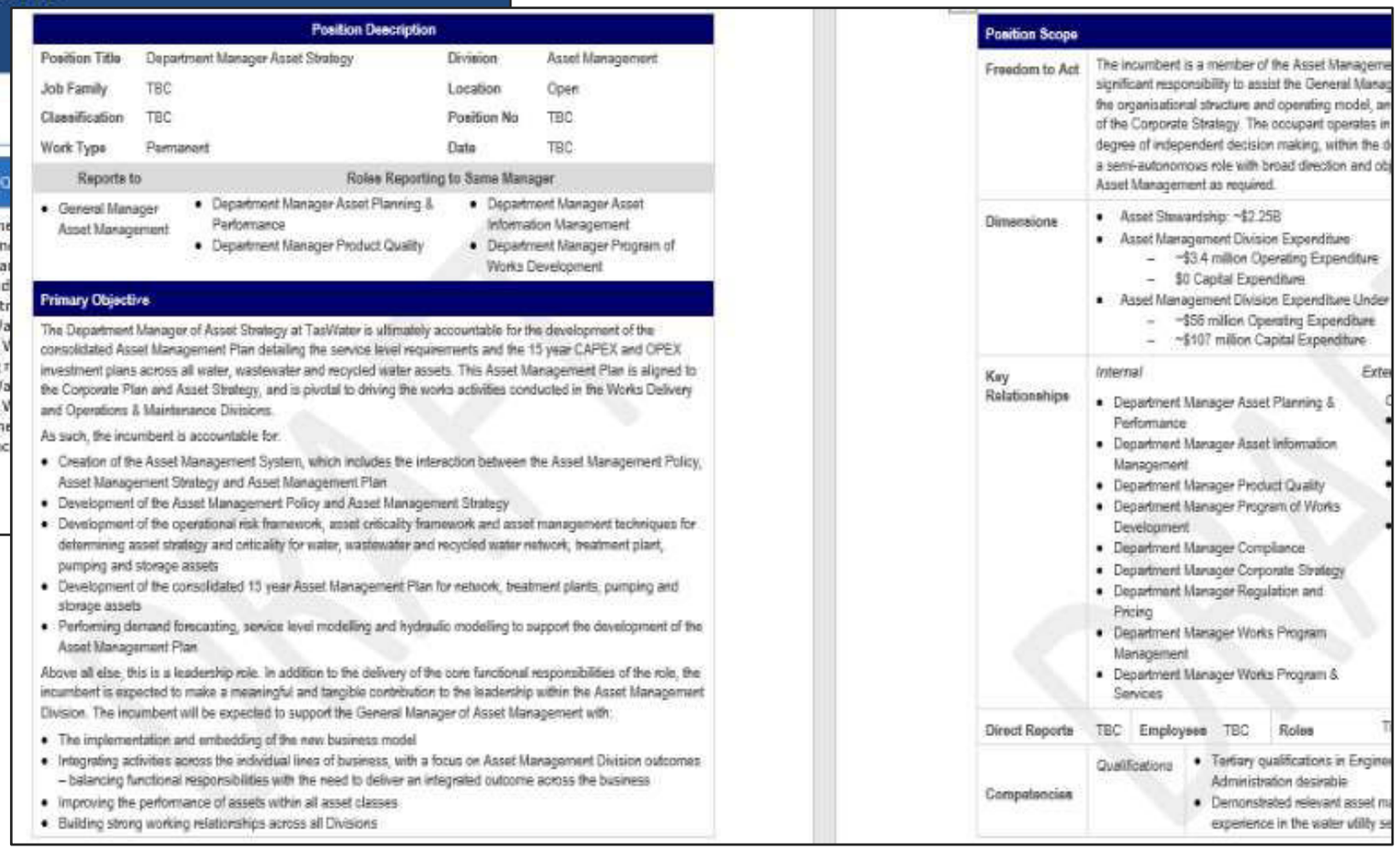
Initiative		2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	Total
Enabling Works												
Flow Balancing												
Verification Meter Survey	Opex	10,000										10,000
New Verification Meter Installation	Capex		400,000									400,000
Bulk Meter Verification Programme	Opex	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	500,000
Digitalisation												
Digital Metering Installation	Capex	1,000,000										1,000,000
Business Case Development	Opex	100,000										100,000
Digital metering operating costs	Opex	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	400,000
Pressure Management												
PRV Asset Survey	Opex	10,000										10,000
PRV Maintenance Programme	Opex	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	400,000
Installation of data loggers	Capex	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	1,000,000
Pressure analysis of DMA & PMZ	Opex	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	400,000
District Metering												
DMA Meter Asset Survey	Opex	25,000										25,000
DMA Meter Maintenance Programme	Capex	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	750,000
Systems Loss Engineer	Opex		100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	900,000
DMA Integrity Testing	Opex	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	500,000
Sub-Total		**1,540,000**	**895,000**	**495,000**	**495,000**	**495,000**	**495,000**	**495,000**	**495,000**	**495,000**	**495,000**	**6,395,000**
Reduction Works												
Leak Detection and Repair												
Active Leak Detection	Opex	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	2,000,000
Leak Repair	Opex	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	20,000,000
Trunk Main leak detection installation	Capex	2,000,000										2,000,000
Customer Metering												
Customer Meter Replacement Programme	Capex	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	10,000,000
Large Customer Meter Replacement Programme	Capex	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	5,000,000
Fire Flow Metering Investigation	Opex	20,000	20,000									40,000
Pressure Management												
PRV Installation	Capex	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	3,000,000
Advanced Pressure Management Systems	Capex		100,000	100,000	100,000	100,000	100,000	20,000	20,000	20,000	20,000	580,000
Asset Management												
PE100 Service Connection Replacement Programme	Capex	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000	15,000,000
Service No Dig Trial Programme	Capex	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	10,000,000
Sub-Total		**8,520,000**	**6,620,000**	**6,600,000**	**6,600,000**	**6,600,000**	**6,600,000**	**6,520,000**	**6,520,000**	**6,520,000**	**6,520,000**	**67,620,000**
Grand Total		**10,060,000**	**7,515,000**	**7,095,000**	**7,095,000**	**7,095,000**	**7,095,000**	**7,015,000**	**7,015,000**	**7,015,000**	**7,015,000**	**74,015,000**

Example ONLY

OUR STRATEGIC ASSET MANAGEMENT PHILOSOPHY AND SERVICE OFFERINGS

Service offering – structure & operating model (1/2)

Development of AM Organisational Structure & Position Descriptions



Position Description

Position Title	Department Manager Asset Strategy	Division	Asset Management
Job Family	TBC	Location	Open
Classification	TBC	Position No	TBC
Work Type	Permanent	Date	TBC

Reports to

- General Manager Asset Management

Roles Reporting to Same Manager

- Department Manager Asset Planning & Performance
- Department Manager Product Quality
- Department Manager Asset Information Management
- Department Manager Program of Works Development

Primary Objective

The Department Manager of Asset Strategy at TasWater is ultimately accountable for the development of the consolidated Asset Management Plan detailing the service level requirements and the 15 year CAPEX and OPEX investment plans across all water, wastewater and recycled water assets. This Asset Management Plan is aligned to the Corporate Plan and Asset Strategy, and is pivotal to driving the works activities conducted in the Works Delivery and Operations & Maintenance Divisions.

As such, the incumbent is accountable for:

- Creation of the Asset Management System, which includes the interaction between the Asset Management Policy, Asset Management Strategy and Asset Management Plan
- Development of the Asset Management Policy and Asset Management Strategy
- Development of the operational risk framework, asset criticality framework and asset management techniques for determining asset strategy and criticality for water, wastewater and recycled water network, treatment plant, pumping and storage assets
- Development of the consolidated 15 year Asset Management Plan for network, treatment plants, pumping and storage assets
- Performing demand forecasting, service level modelling and hydraulic modelling to support the development of the Asset Management Plan

Above all else, this is a leadership role. In addition to the delivery of the core functional responsibilities of the role, the incumbent is expected to make a meaningful and tangible contribution to the leadership within the Asset Management Division. The incumbent will be expected to support the General Manager of Asset Management with:

- The implementation and embedding of the new business model
- Integrating activities across the individual lines of business, with a focus on Asset Management Division outcomes – balancing functional responsibilities with the need to deliver an integrated outcome across the business
- Improving the performance of assets within all asset classes
- Building strong working relationships across all Divisions

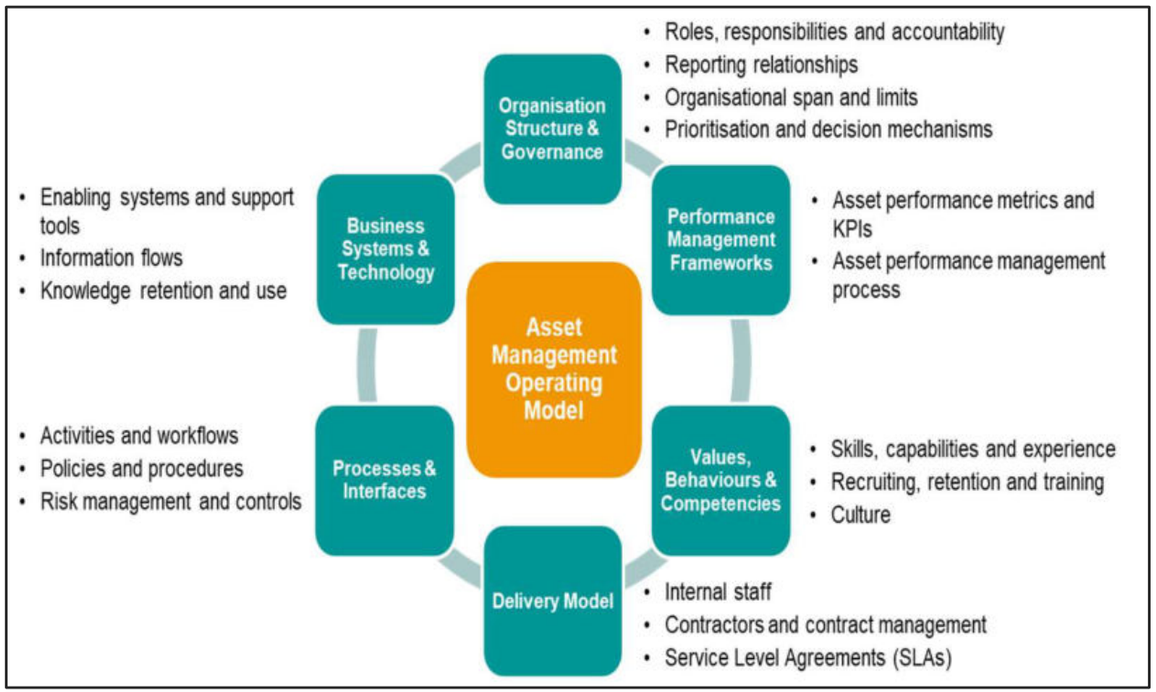
Position Scope

Freedom to Act	The incumbent is a member of the Asset Manageme… significant responsibility to assist the General Manag… the organisational structure and operating model, an… of the Corporate Strategy. The occupant operates in… degree of independent decision making, within the d… a semi-autonomous role with broad direction and ob… Asset Management as required.
Dimensions	• Asset Stewardship: ~$2.25B • Asset Management Division Expenditure – ~$3.4 million Operating Expenditure – $0 Capital Expenditure • Asset Management Division Expenditure Under… – ~$56 million Operating Expenditure – ~$107 million Capital Expenditure
Key Relationships	Internal • Department Manager Asset Planning & Performance • Department Manager Asset Information Management • Department Manager Product Quality • Department Manager Program of Works Development • Department Manager Compliance • Department Manager Corporate Strategy • Department Manager Regulation and Pricing • Department Manager Works Program Management • Department Manager Works Program & Services
Direct Reports	TBC Employees TBC Roles
Competencies	Qualifications • Tertiary qualifications in Engine… Administration desirable • Demonstrated relevant asset m… experience in the water utility se…

- Isle has a repository of *asset management structures* at a holistic, business unit, division and team level
- Isle can develop *asset management position descriptions* for Executive and Manager level roles

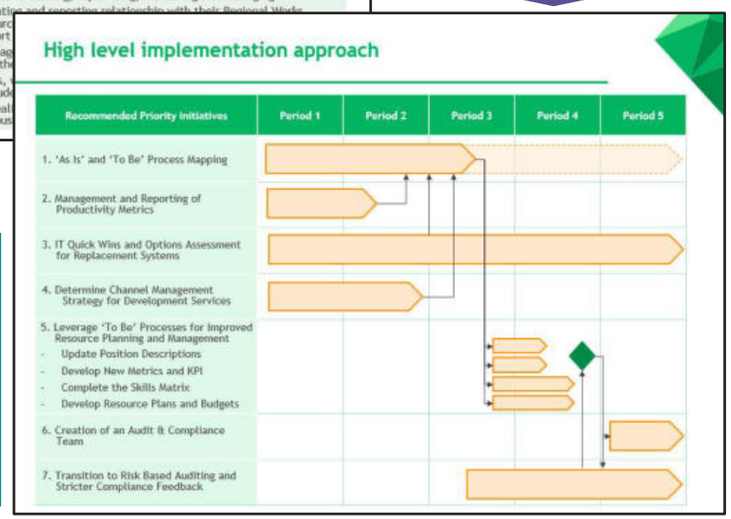
Service offering – structure & operating model (2/2)

Delivery of AM Operating Model Diagnostics



Assessment of current performance

Recommended initiatives and high level timeframes

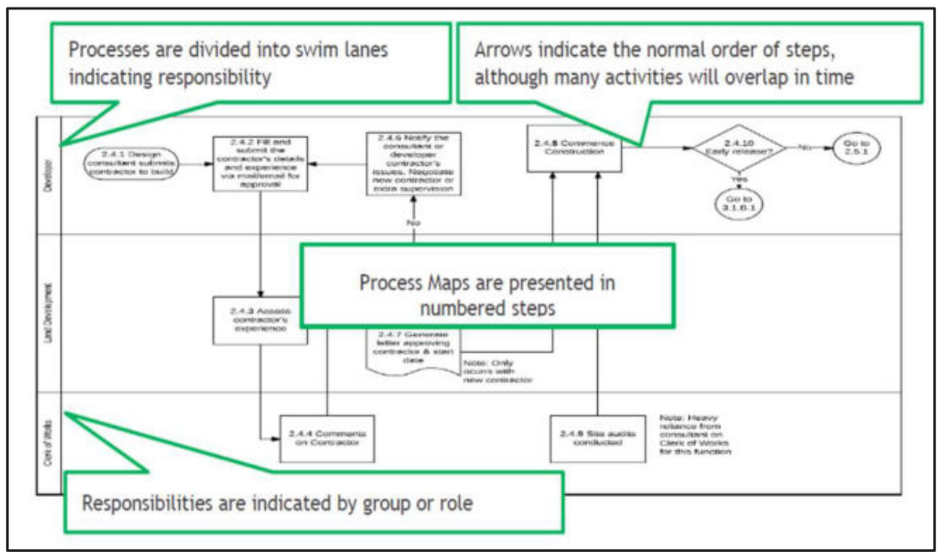


- Isle identify *strengths and weaknesses across each element,* plus an overall assessment of capability for that element
- We provide *high priority recommendations* in relation to people, process and systems to close gaps in each element
- Isle develop *time-lined improvement initiatives* to close high priority gaps

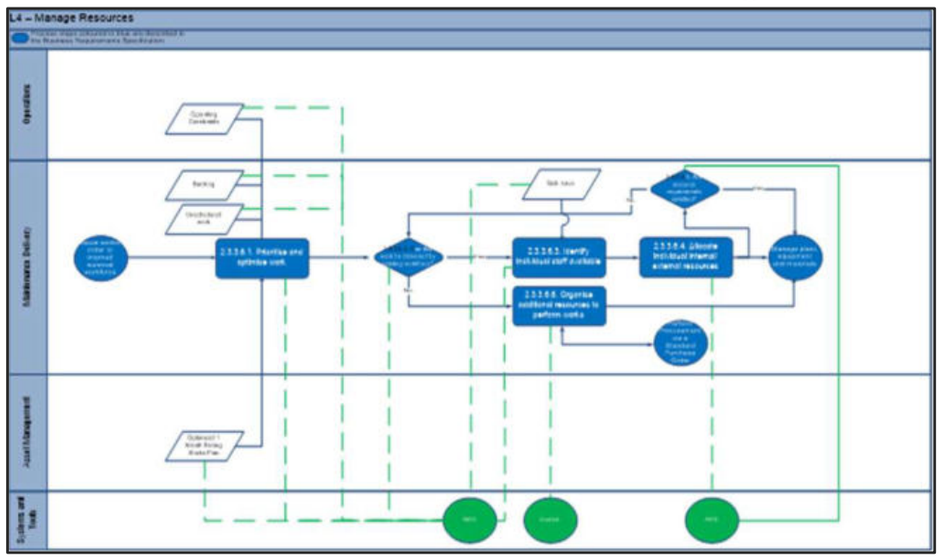
Service offering – process optimisation

Conduct AM Process Re-design

'As-Is' Process Maps (including observed process challenges linked to map)



'To-Be' Process Maps



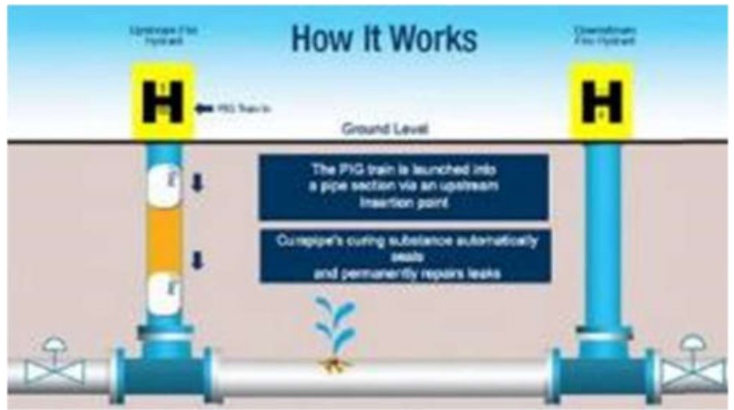
Task / Data Tables include RACI Analysis

- Isle has a repository of *asset management processes covering the entire asset life cycle* (i.e. from asset creation through to asset replacement)
- Our 'To-Be' deliverables include *process maps*, *Responsible-Accountable-Consulted-Informed (RACI) analysis* and identified *non-process improvements*

Step	Purpose	Data Input	Data Output	AP Stakeholder/s	W Stakeholder/s	Program Champion	Project Initiator	General Managers	CPCD – General Manager	SP – General Manager	AP – General Manager	W – General Manager	Project Manager	SP – Corporate Planning & Sustainability	SP – Pricing and Regulation	CPCD - Planning	CPCD – Governance and Performance	FMISC
Develop Asset Plans			• Asset Plans	R	R						A	A						
Develop Strategic Plans			• Strategic Plans							A				R				

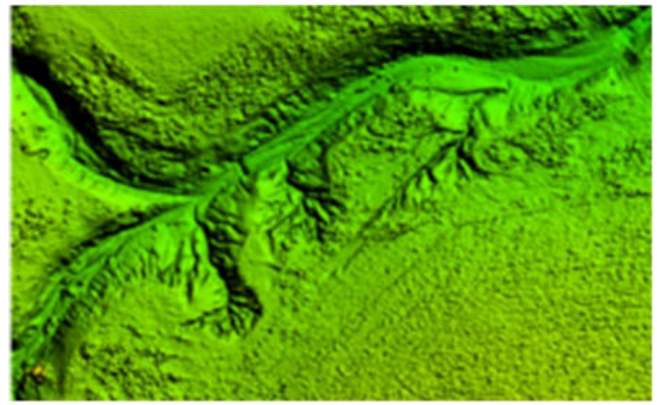
Service offering – innovation & technology scans

Delivery of Scans Focussed on AM Innovation & Technology



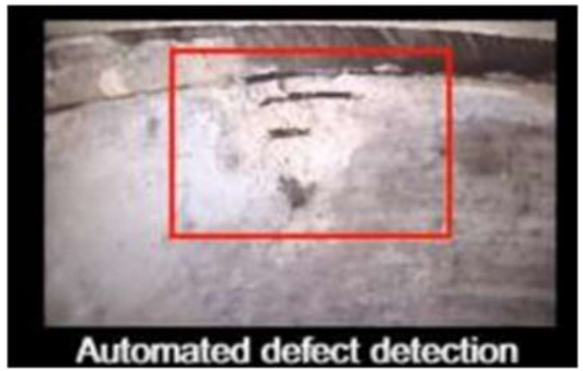
Curapipe™ (UK)

Smart Valve™ (Smart Valve, UK)



Australian UAV™ (AU)

- Over the last 13 years, Isle has been developing an *extensive water innovation & technology ecosystem* supporting asset management decision making, which consists of *6,000+ technologies* and *over 200 water utilities* across *11 different countries*



Vapar™ (AIMI, AU)

Hindsite™ (Hindsite, AU)

Service offering – capacity building

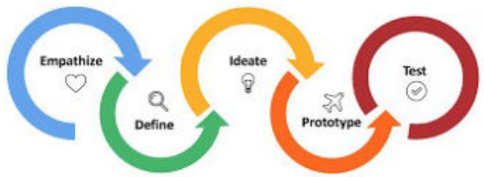
Design and delivery of capacity building programs, in helping businesses leverage more out of their investments, inspire better decision making capability amongst key stakeholders and appreciate value delivery of asset management across the organisational spectrum

Creating a common understanding of asset management from Executive through to practitioners

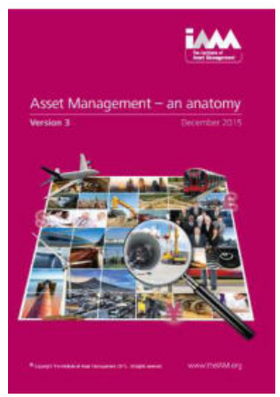
- Our asset management practitioners possess a range of skills and qualifications, from *Executive Leadership strategy facilitation*, and design-thinking, through to *delivery of competency based training, with IAM UK Qualified trainers*

Adapting multiple modes of delivery to suit specific challenges and learning requirements of the business

Application of **Design Thinking** principles, using professional facilitators, to simplify complex AM issues in an engaging and value added manner



Group learning and facilitation (in person and online) through qualified trainers, proficient in understanding & application of Global AM frameworks, (GFMAM, ISO55000 suite of standards), and upskilling/building competencies at multiple levels across the business



GFMAM Global Forum on Maintenance & Asset Management

Skilled and informed workforce making informed decisions

OUR TEAM AND EXPERIENCE

FARSHAD IBRAHIMI

Head of Asset Management

farshad.ibrahimi@isleutilities.com

Farshad has over twenty (20) years experience in Australia and the Middle East, across Water, Transport and Energy sectors. He led the delivery of end to end asset management (AM) from development of strategy to implementation and transformational programs. He held global service line leadership roles in asset management with international consultancies, prior to joining Isle, and was Australia/NZ Region Coordinator for the successful delivery of 2008 and 2012 IWA/WSAA International AM Benchmarking Programs, and Program Leader for the delivery of 2020 WSAA AMCV International Benchmarking.

PAUL HARRIS

Head of Business Consulting

paul.harris@isleutilities.com

Paul has over twenty-five (25) years of experience in infrastructure, particularly in the global water, electricity, gas, rail, airline and manufacturing industries. His key areas of expertise include asset management (AM) strategy, operating model, structures, roles, processes, practices and systems. He has managed several IWA-WSAA Civil Maintenance, Mechanical & Electrical Maintenance, and Customer Service Benchmarking Programs. He was also a member of the delivery team in the successful 2008, 2012 and 2020 IWA-WSAA International Asset Management Benchmarking Projects.

DEREK ATKINSON

Head of International Benchmarking

derek.atkinson@isleutilities.com

Derek has over fifteen (15) years of experience working across the Design & Construction, Strategic Policy Development and Performance Management processes for a wide variety of infrastructure sectors (e.g. water, electricity transmission, transport, mining) in the Asia-Pacific and European regions.

Derek has successfully delivered a wide range of Strategic Asset Management Process and Information System reviews, and currently has a key role in the 2020 IWA-WSAA International Asset Management Benchmarking Project.

GARY WYETH

Senior Consultant

Asia

Gary has 30 years experience in the water industry, with 27 of those years whilst working in South-East Asia. During this period he has gained member status of the CIWEM (UK) and is the current Secretary of the IWA Water Loss Specialist Group.

Gary started his career as a network modeling engineer for Biwater International and through this built up an expertise in how water supply systems operate. He then moved into NRW management, with Thames Water International and Ranhill Water Systems, gaining further expertise in leakage control, DMA design & implementation, system monitoring, customer metering and production metering.

CAMERON MCPHAIL

Consultant

Australia

Cameron has experience across a broad range of areas including R&D, futures planning, design thinking, AI (machine learning and evolutionary algorithms), asset management, systems modelling, software development, and agile methodologies. Cameron has previously applied these skills as part of research and industry teams across Australia, Europe, and North America, working with people from a diversity of backgrounds and disciplines.

Cameron was the Analytics Lead for Isle's 2020 Leakage Management Benchmarking Program.

Strategic Asset Management Experience – Global

International Water Association (IWA) and Water Services Association of Australia (WSAA)

In 2008, 2012 and 2020 Isle consultants have co-led several **Asset Management Performance Benchmarking Programs** for up to forty (40) participant water utilities in each program from Australia, New Zealand, Canada, the Philippines, Sultanate of Oman, United Arab Emirates and the United States. These programs compared the process completeness and effectiveness of international water utilities across the many elements of the asset life cycle (i.e. strategic planning, asset acquisition through to asset replacement and disposal). These programs are currently aligned with the Global Forum in Maintenance and Asset Management (GFMAM) Framework and have been hugely successful in increasing the asset management maturity of the international water industry.

Manila Water (Philippines)

Isle consultants were involved in the design and delivery of systems integrations for Manila Water, Philippines, which aimed at addressing some critical asset management challenges at an enterprise level, as a result of disintegrated information systems. Manila Water's EAM program led to the delivery of a world first fully integrated asset management information system, which designed and implemented over 34 separate system integrations, across multiple asset and non asset information systems (i.e. GIS, Works Management, SCADA, BI, Finance, Customer Billings).

Thames Water (UK)

Isle delivered two global knowledge sharing and best practice reports for Thames Water, the largest water company in the UK: 1) global best practice for management of desalination assets, and 2) global strategies for managing assets during significant growth in population. The projects involved water utility interviews to identify 'out-of-the-box' digital innovations and solutions that address key challenges under these two areas.

Strategic Asset Management Experience – Australia (1/2)

South East Water (Victoria)

South East Water (SEW) required an external review of their AM system capabilities and performance. Isle consultants were commissioned to deliver an Asset System Strategy and 10-year Roadmap. The major focus was to ensure SEW maintained their leading position as a sophisticated water asset management organisation. We delivered a comprehensive Asset System Strategy that provided SEW: (1) Detailed diagnosis of their current Asset Systems, identifying which systems were sufficient, and which needed to be upgraded or replaced, (2) Several actionable options with a clear path forward to gain needed capabilities and avoid operational risks (with costs detailed appropriately), and (3) A detailed roadmap to help these capabilities become tangible and achievable.

City West Water (Victoria)

City West Water were preparing for the 2016 Asset Management Performance Benchmarking Study (Aquamark), to be conducted by the International Water Association (IWA) and Water Services Association of Australia (WSAA). Isle consultants were engaged to assess their alignment with ISO 55001 and develop an action plan to close gaps. City West Water gained an understanding of their strengths and weakness in relation to the various clauses of the ISO 55001 standard. A prioritised series of recommendations for addressing the areas of non-alignment to ISO 55001 provided focus for achieving better alignment to this standard.

Barwon Water (Victoria)

In response to a number of organisational interface and delivery challenges, Isle consultants reviewed the organisation's Strategic Asset Management Model in the context of the roles and accountabilities for Asset Owner, Asset Manager and Asset Services Provider for the management of Technical Services assets. We developed a series of asset management recommendations in relation to organisational structure, roles and accountabilities, and systems. The project also resulted in the development of Barwon Water's Asset Management Policy.

Strategic Asset Management Experience – Australia (2/2)

PowerWater (Northern Territory)

Isle consultants delivered a project that was initiated to respond to increasing public and regulatory scrutiny due to successive serious asset failures and reliability performance issues. The team developed a reporting framework based on an asset condition and criticality reporting matrix that could be rapidly deployed in the field, whilst being fully integrated with an overhaul of the Asset Information System. This framework was complemented by an excel-based Asset Management Reporting System which automated the development and reporting of indices for asset condition, criticality, risk and maintenance for individual asset classes.

Wannon Water (Victoria)

Wannon Water engaged Isle consultants to conduct an organisational review of their Asset Systems Branch, with the objective to determine what new skills were required within the area, whether some manual tasks could be automated to free up resources and to clarify the process interfaces with some key service delivery functions (e.g. particularly the maintenance planning and scheduling functions). Using an Organisational Diagnostic Framework that reviewed the branch in the context of organisational structure and role clarity, culture, processes, systems and performance management, a number of initiatives relating to improved asset management were identified.

TasWater (Tasmania)

In response to the need to create a state-wide organisation from Ben Lomond Water, Cradle Mountain Water, Onstream and Southern Water based on PAS—55 Asset Management Principles, Isle consultants were engaged to design the organisation structure for the executive and management levels, and allocate five hundred (500) staff across the business. The engagement included the development of all managerial position descriptions, a transitional asset management structure and a summary of the cost and benefit to transition to the new organisation structure.

Our Benchmarking Experience

International Water Association (IWA) and Water Services Association of Australia (WSAA)

Isle consultants co-led the **2020, 2012 and 2008 Asset Management Performance Benchmarking Programs** for up to forty (40) participant water utilities in each program from Australia, New Zealand, Canada, the Philippines, Sultanate of Oman, United Arab Emirates and the United States. These programs compared the process completeness and effectiveness of international water utilities across the many elements of the asset life cycle (i.e. strategic planning, asset acquisition through to asset replacement and disposal). These programs were hugely successful in increasing the asset management maturity of the international water industry.

International Water Association (IWA) and Water Services Association of Australia (WSAA)

Isle consultants led a **Customer Service Process Benchmarking Program** for fifteen (15) participant water utilities from Australia, New Zealand, United States, Portugal and Hungary. These programs compared cost and service level performance across a range of customer service activities, highlighted international best practices across these activities and culminated in an information sharing and relationship networking best practices workshop. This program provided a series of extremely insightful practices in relation to customer systems and paved the way for changes in customer management within Australia.

Australian Water Retailers

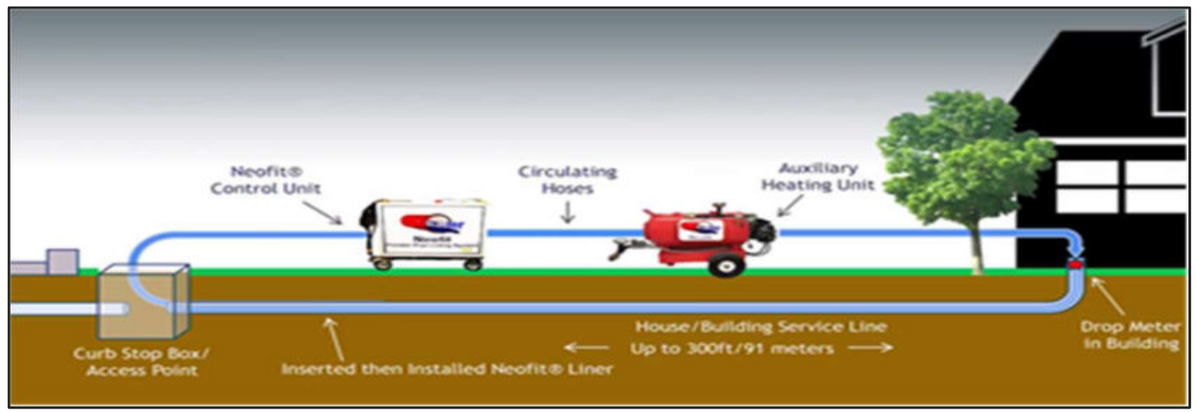
Over several program iterations, Isle consultants have delivered **Civil Maintenance Process Benchmarking Programs** for a number of metropolitan and regional water utilities in Australia. These programs have been pivotal to identifying the difference in cost and service level performance trends for metropolitan and regional water utilities. These performance insights have also been key to driving substantial cost and service level improvements across the industry (between 5 – 20% improvement), and have guided the adoption of centralised organisational structures, mixtures of insourced and outsourced workforces, skills -based training, and centralised and field-based technologies to support these improvements.

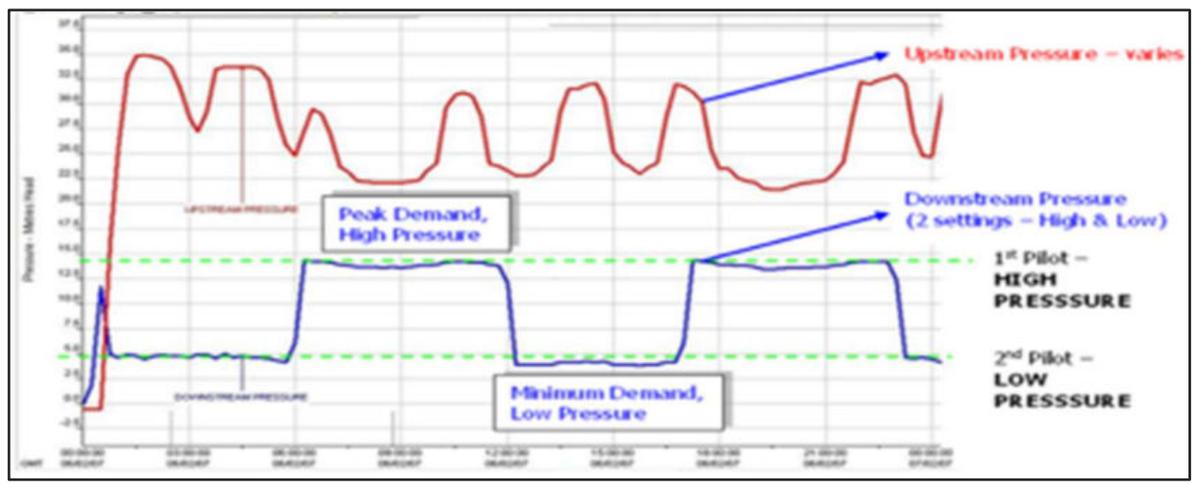
CASE STUDY – SYSTEM LEAKAGE MANAGEMENT PLAN

With the focus on Australia's water industry increasingly turning to minimisation of Non-Revenue Water (NRW) and more effective leakage monitoring, Isle Utilities (Isle) were engaged by Unitywater (Queensland, Australia) to develop their System Leakage Management Plan (SLMP).

The SLMP developed by Isle Utilities (Isle) to reduce water losses and hence NRW for Unitywater's water supply infrastructure was very detailed, deeply analytical and based on verified operating information provided by Unitywater. The SLMP contained many recommendations, as focused within the following nine areas of water loss management: (i) Water Balance, (ii) DMA Reporting, (iii) Active Leakage Detection, (iv) Pressure Management, (v) Meter Replacement, (vi) Response Time, (vii) Digital Neighbourhood Plan, (viii) Bulk Metering and (ix) Asset Management Data.

The SLMP recommended that Unitywater would get the **largest leakage reduction benefits** from an initial focus on three core programs: **(1) Advanced Pressure Management, (2) Service Pipe Replacement and (3) Active Leakage Detection.**





CASE STUDY – 2021 LEAKAGE MANAGEMENT BENCHMARKING PROGRAM

Isle Utilities (Isle) delivered a collaborative Leakage Management Benchmarking Program for a group of Australian, United Kingdom (UK), New Zealand and Italian water businesses. Like the 2020 program, this program focused on how the industry conducts the evaluation of Non-Revenue Water, and the four internationally accepted pillars of leakage management: Pressure Management, Active Leakage Control, Speed & Quality of Repairs, and Asset Management.

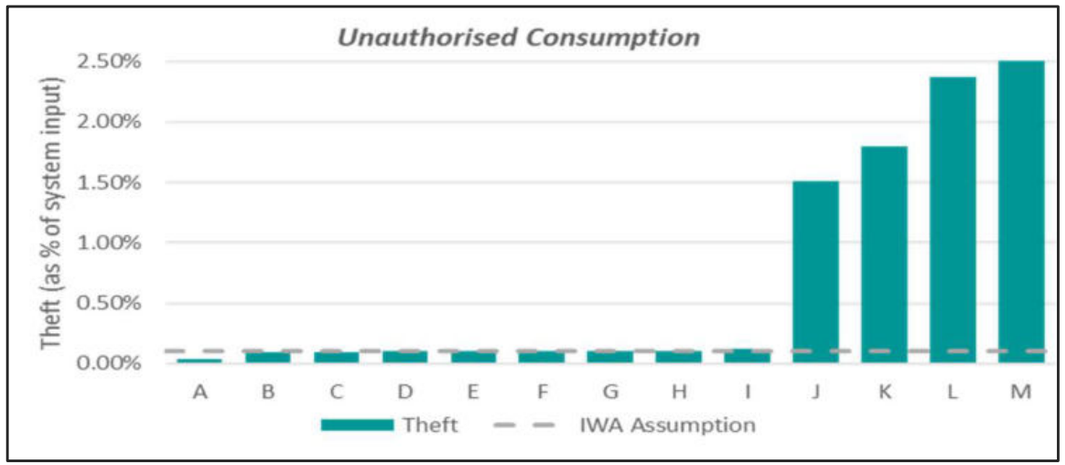
Water Balance Reconciliation

Regulatory requirement

- Requirement to quantify all Water Balance components
- Any imbalance (positive or negative) must be reconciled
- Imbalance must be <5% of distribution input
- Reconciliation must take place to produce regulatory reported components (e.g. PCC, Leakage)

	pre-reconciliation		*post-reconciliation*	
2019/20 Water Balance	**Ml/d**	**Proportion**	**Impact**	**Ml/d**
Distribution input	1258		-11	1246
↳ Metered household consumption	278	22%	4	282
↳ RV household consumption	357	28%	17	375
↳ Metered commercial consumption	268	21%	6	274
↳ RV commercial consumption	2	0.1%	0	2
↳ Illegal water use	18	1.5%	4	22
↳ Legally unbilled water use	13	1.1%	3	16
↳ YW operational water use	2	0.2%	1	3
↳ Leakage	262	21%	9	271
↳ Unaccounted for water (UFW)	56	4.5%		0

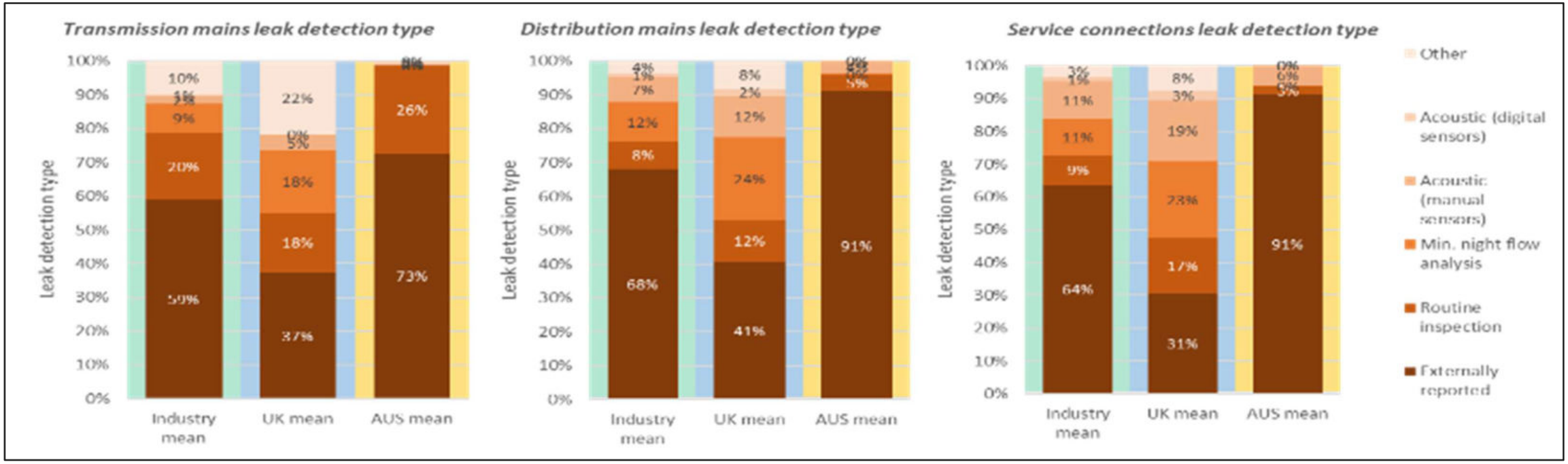
This collaborative program identified best practices relating to the **'bottom-up' calculation of Non-Revenue Water** (rather than adoption of standard IWA, WSAA and water industry assumptions to complete the calculation), the **management of water theft during the development of greenfield sites**, and **operating under a legislated leakage performance reward and penalty regime.**



CASE STUDY – 2020 LEAKAGE MANAGEMENT BENCHMARKING PROGRAM

Isle Utilities (Isle) delivered a collaborative Leakage Management Benchmarking Program for a group of Australian, United Kingdom (UK), New Zealand and Italian water businesses. This program focused on how the industry conducts the evaluation of Non-Revenue Water, and the four internationally accepted pillars of leakage management: Pressure Management, Active Leakage Control, Speed & Quality of Repairs, and Asset Management.

This collaborative program identified best practices and leading technologies relating to **advanced pressure management systems**, **active leakage control supported by sophisticated technology** and **robust asset management decision making**.



CASE STUDY – ASSET MANAGEMENT BENCHMARKING

Isle consultants co-led the **2020, 2012 and 2008 Asset Management Performance Benchmarking Programs** for up to forty (40) participant water utilities in each program from Australia, New Zealand, Canada, the Philippines, Sultanate of Oman, United Arab Emirates and the United States. These programs compared the process completeness and effectiveness of international water utilities across the many elements of the asset life cycle (i.e. strategic planning, asset acquisition through to asset replacement and disposal).

These programs have more recently been based on the Institute of Asset Management (IAM) and GFMAM international assessment frameworks and have been hugely successful in increasing the asset management maturity of the international water industry.

GFMAM
Global Forum on Maintenance & Asset Management

STRATEGY & PLANNING	1. Asset Management Policy 2. Asset Management Strategy & Objectives 3. Demand Analysis 4. Strategic Planning 5. Asset Management Planning	AM DECISION-MAKING	6. Capital Investment Decision Making 7. Operations and Maintenance Decision Making 8. Life Cycle Value Realisation 9. Resourcing Strategy 10. Shutdowns & Outage Strategy
LIFECYCLE DELIVERY	11. Technical Standards and Legislation 12. Asset Creation & Acquisition 13. Systems Engineering 14. Configuration Management 15. Maintenance Delivery 16. Reliability Engineering 17. Asset Operations 18. Resource Management 19. Shutdown and Outage Management 20. Fault and Incident Response 21. Asset Decommissioning and Disposal	ASSET INFORMATION	22. Asset Information Strategy 23. Asset Information Management 24. Asset Information Systems 25. Data and Information
ORGANISATION & PEOPLE	26. Procurement and Supply Chain Management 27. Asset Management Leadership 28. Organisational Structure 29. Organisational Culture 30. Competence Management	RISK & REVIEW	31. Risk Assessment and Management 32. Contingency Planning & Resilience Analysis 33. Sustainable Development 34. Management of Change 35. Assets Performance & Health Monitoring 36. Asset Management System Monitoring 37. Management Review, Audit & Assurance 38. Asset Costing & Valuation 39. Stakeholder Engagement

CASE STUDY – LEAKAGE TECHNOLOGIES HORIZON SCAN

Oslo

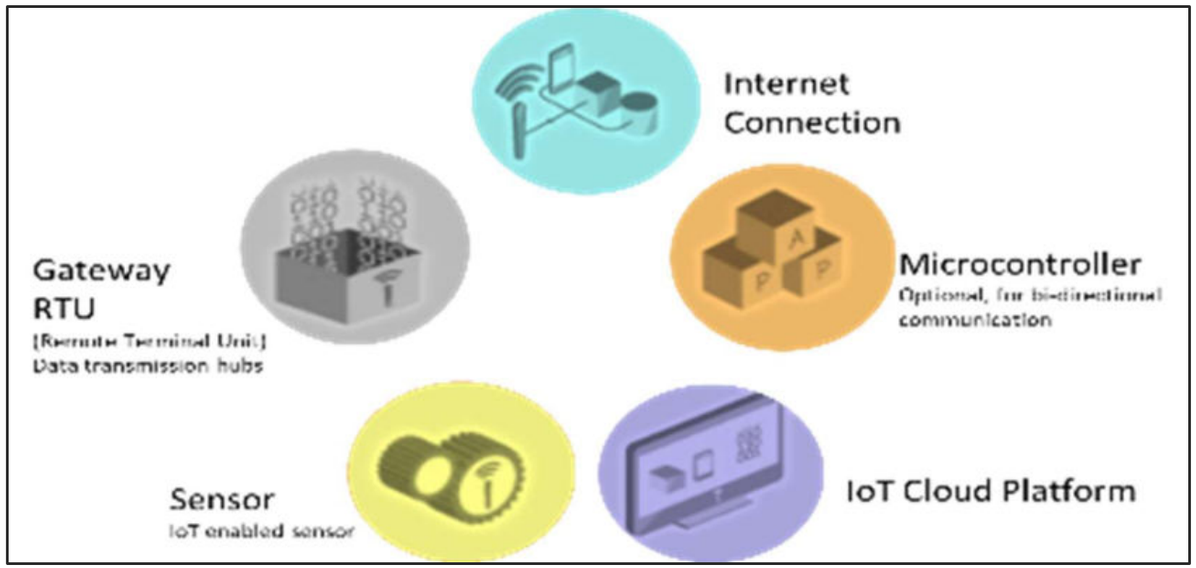
Oslo VAV wanted to apply more sensors in their network in order to reduce leakages and to make steps towards a data driven water distribution, as part of the leak reduction initiative in the municipality. Given Isle Utilities' (Isle's) strong track record of supporting utilities with their digital strategies and instrumentation, we supported Oslo VAV by using a stepped approach in forming a coherent strategy for the deployment of smart sensors.

25 leakage technologies identified

A deep technology assessment was done for 11 shortlisted technologies

Information collated on the technologies and assessed according to financial, technical and case study criteria

Final report provided intelligence on the technologies as well as their Technology Readiness Level (TRL)



This collaborative project identified and reviewed a wide range of technologies. Short-listed technology was subsequently rated according to method (i.e. hydrophone, accelerometer, pressure, flow, etc), type of installation (i.e. fixed, lift and shift) and communication (i.e. Radio, 3G, 4G, 5G, GPRS, NBIoT, etc).

CASE STUDY - WSAA W-LAB

W-Lab is a network of innovators, water experts and over 100 water authorities across Australia and New Zealand. As the key delivery partner for WSAA's W-Lab Program, Isle Utilities leveraged our global network to provide collaboration, insights and expertise to enable the co-design of the W-Lab Technology Roadmap.

W-Lab uses four innovation frames in their Technology Roadmap, Customer, Nature, Enterprise and the Circular Economy. Under each innovation frame there are key opportunity areas which need to be addressed in order to achieve the ultimate vision of a secure water future.

Within the Circular Economy frame, water utilities have identified the areas of creating new markets and recovering waste, including the circular economy in the home and improving community understanding of waste and value.

To this end, Isle has accumulated a deep understanding of the needs of the industries involved and has already evaluated over 300 novel technologies (including leakage management technologies) in this space.