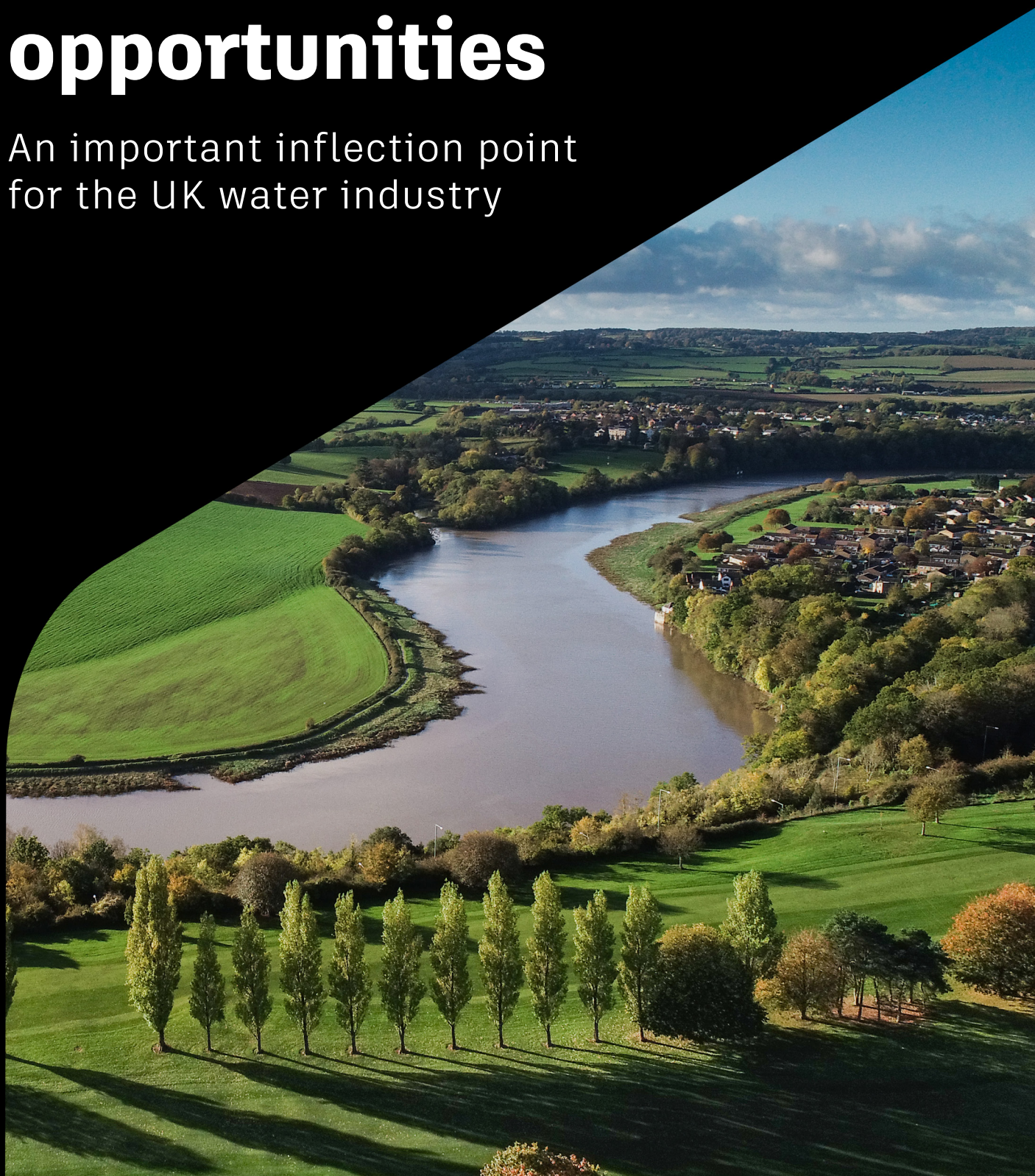
AUTODESK

AMP8's unprecedented opportunities

An important inflection point for the UK water industry



AMP8’s unprecedented opportunities

An important inflection point for the UK water industry

Beginning April 1, 2025, and running for five years, AMP8 replaces the existing £51 billion AMP7 investments in the water sector with a new set of challenges and targets. A record £96B has been requested by water utilities for infrastructure and monitoring during AMP8 – the largest ever budget for an asset management plan. This is 88% more money requested than during the last period. Ofwat has reduced the amount to be granted to £88B, tightening the belt for water companies and negotiating spending down slightly, but it is still a significant amount of money for the beleaguered water sector.

AMP8 represents a unique opportunity for water professionals in the UK, who may be able to secure funding for three key priorities:

- Digitalisation: Adopt full digitalisation and data-centric ways of working
- CSOs: Switch from reacting to CSO spills to proactively preventing them before they happen
- Nature-based solutions: Incorporate Biodiversity Net Gain (BNG) and Sustainable Drainage Systems (SuDS) into regular ways of working

3 things Ofwat wants

There are additional supply chain and workforce challenges wrapped up tightly in AMP8, but we think these three priorities represent the essence of Ofwat’s advice.

Advanced real-time monitoring of water networks

Wastewater networks managed to prevent sewage spills and transparent reporting for the public on water quality in rivers and seas

Significantly more green/blue infrastructure

How we got here

To say that much has changed since AMP7 would be an understatement

There has been a growing outcry for the UK government to open its purse and help solve the water industry's many challenges. With AMP8, that is about to happen. The AMP8 funding cycle is a prime opportunity for water professionals to improve their infrastructure, processes, and approach to solving problems.

This report will highlight the opportunity and provide you with a winning strategy that employs digital twin hydraulic modeling and nature-based drainage techniques to flip your approach from being reactive to actively designing, predicting, and employing solutions to stop CSO spills before they happen and build in more environmentally friendly ways. The way forward, as outlined by Ofwat and the Environment Agency, requires water professionals to focus on digitalisation and data, and it strongly encourages them to put nature-based solutions like SuDS at the top of their hierarchy of solutions.

In short, regulators want to see change, and they are ready to allocate record levels of AMP funding to help water professionals take deliberate steps to improve their operations.

In early 2020, at the beginning of the global pandemic, the water industry in the UK had been in deep discussion about reaching Net Zero Carbon Emission goals by 2030. There was much optimism at the time for reaching the goal early, which would, if seen through, beat the UK's broader target of Net Zero emissions by 2050 by twenty years. But so much has happened since then which has shifted the priorities of both Ofwat and water utilities.

The connection to nature that bloomed during the pandemic may have been one of the only welcome side effects of COVID-19, which required everyone to slow down and take a perhaps-much-needed break. A change in our habits reminded everyone how interconnected

and vulnerable humans can be. As our consumption patterns subsided or changed, we were able to see just how unsustainable some aspects of our society were – and that includes how we use water.

During lockdown, we rediscovered our local environments. The story in the UK was one of discovery, as some people swam in their local streams and rivers for the first time. This led many to take an increased interest in water quality which led to more public awareness of where local wastewater treatment plants were located and how they were performing, particularly after heavy rainfalls. Visible pollution from CSOs led to the rise of the citizen science movement, with individuals using their right to request information from water companies about effluent discharges, and then posting the results on the Internet.

All of these factors have encouraged regulators to dramatically step-up enforcement. Even before the pandemic began, Ofwat, the economic regulator of the water industry, imposed a record-breaking £126M fine on Southern Water for breaches of discharge permits and causing environmental harm. The regulator has gone on to investigate the entire industry and is progressing with enforcement against potentially five more companies.

The penalties are serious. The Environment Agency has even suggested that they could impose prison sentences for CEOs.

These trends seem to have reached a tipping point, with questions about the financial viability of both Thames Water and the water industry at large coming into question, with a reputed £60+ billion of debt amassed across the sector. The increased debt load of water companies has not helped water professionals respond to these challenges. Should some of these companies, who may be facing existential threats, be bailed out or re-nationalised? How can politicians and regulators ensure that desperately needed future water infrastructure funding will be put to good use? These issues are far from solved, but the important work of water professionals must continue, regardless of the outcome.

One thing is for certain, these high-profile developments have surely influenced the choices that Ofwat plans to make for AMP8, and by extension the choices you may need to make to meet regulatory challenges and move forward with confidence. While this may feel like a real time of crisis for the water industry, it is also the best opportunity UK water professionals have to secure much-needed funding and improve the industry's ways of working to meet and exceed the challenges of the future.

> “Overflows that are causing the most harm will be addressed first to make the biggest difference as quickly as possible, and water companies will be expected to consider nature-based solutions in their planning.
>
> Storm overflows discharge reduction plan

DIGITALISATION

Where technology is going and how to get there

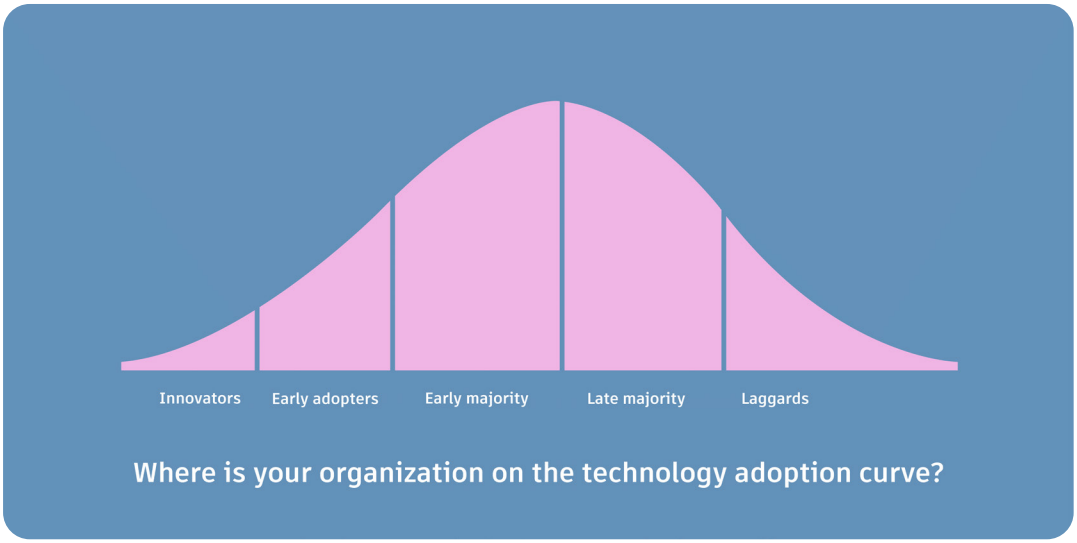
The first pillar of opportunity is around digitalisation.

There is a technology spectrum that exists for water professionals that ranges from doing everything manually using data entry, site logs and spreadsheets to having a separate digital-based system for every aspect of operations. Most water professionals, and likewise most organisations, already know where they fall on this technology spectrum. In simplistic terms, they will either invest more money in digitalisation in the coming funding cycle or invest more time in less efficient work-arounds to enable them to get their jobs done.

Placing yourself on the technology lifecycle

No matter where you are on the digital maturity journey, securing funding for data-centric systems is step one. Changing your organization's internal status quo and ways of working is the next step, but AMP8 is a real opportunity to secure funding to pursue organisational change that pushes everyone you work with further down the line towards technological efficiencies.

Perhaps more importantly, AMP8 offers an unprecedented opportunity to attract the next generation of water workers. The water industry in the UK is made up of some of the most knowledgeable engineers in the world, but it still struggles with a talent shortage as it must replace its aging workforce with fresh-faced recruits who grew up with, and expect, the best technological tools. This talent shortage falls particularly in the realms of data analytics, AI, and digital development. Water companies need more digital leaders inside their organisations who can help build connected systems and instill data-centric processes that will move them away from gathering data from disparate sources and from a reliance on outdated technologies.



Where is your organization on the technology adoption curve?

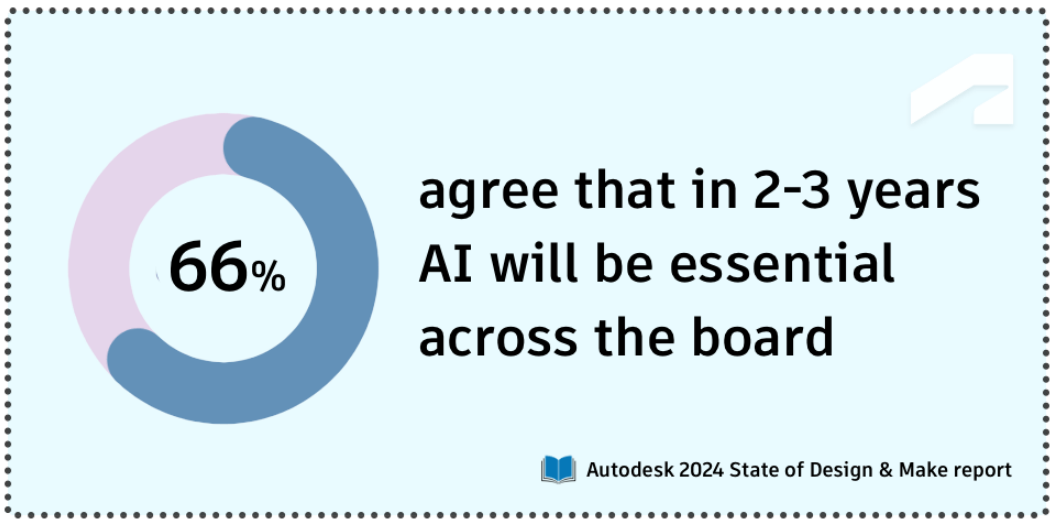
DIGITALISATION

The promise of AI and ML

Despite these workforce challenges, the greater technological outlook for the water industry is positive. No matter where you and your organisation are on the technology spectrum, the future for infrastructure design and operations is looking bright when you consider the advances in AI and ML, which could not have been predicted even a few years prior. Platforms that enable collaboration and knowledge sharing are already changing the way the water industry works, in much the same way that they have for the energy and construction sectors, and these platforms are evolving rapidly.

In essence, the technological tools embedded in these platforms are being upgraded with the addition of Artificial Intelligence and Machine Learning. These revolutionary technologies have the potential to be applied across nearly all areas, from helping to prevent accidents, to cutting down time spent reviewing and investigating issues, to building better drainage designs.

While it seems that the early stages of AI and ML are flooded with an overabundance of marketing hype, there is no denying that these innovations are profound and will have a long-lasting impact on the water industry. If you are not yet an early adopter and are still skeptical, we think the chances are high that a majority of UK water professionals will be relying in some way on AI-assisted design tools within the next two years. A whopping 66% of our



customers believe that in 2-3 years AI will be essential to their work.
In some ways, these new (and disruptive) technologies provide an opportunity for organisations that are at the beginning of their digital transformation to potentially advance a stage – or even two – of the traditional technology adoption lifecycle. We think that early adopters will be rewarded the most.

DIGITALISATION

Innovation is moving forward, rapidly

As early adopters of technology ourselves – and as sellers of software to the water industry – we are naturally biased about the potential of technology. We believe that almost full digitalisation of the water industry is necessary and inevitable. Although it may not happen as speedily as tech evangelists hope, we are very bullish about the digitalisation gains that AMP8 will unlock. We're moving quickly to build solutions that help water professionals move themselves further along the technology adoption lifecycle. Innovation for the water industry is here now, and it's moving forward at an extraordinary pace.

Since Innovyze joined Autodesk two years ago, we've been making significant progress together:

- Striking cloud efficiencies: We've been embracing a cloud-first approach, which has already allowed us to build next-generation SaaS apps that dramatically improve the user experience and turbocharge the data analytic capabilities that we can offer.

- Interoperability and collaboration: We've been connecting applications across the Autodesk platform, tightening them to provide greatly enhanced interoperability. We want to break down barriers between industries and connect office workers with on-site engineers so that everyone is working together towards shared goals.

- API and coding: We've been expanding our APIs and encouraging code-savvy customers to dig into SQL and Ruby for automation gains. We want developers to be able to create what they need for both day-to-day operations and special projects.

Our desktop software is free for educators

Did you know that our desktop water software is now free for educators and students? Read the announcement on the One Water Blog and please help us get the word out by sharing this good news with students and teachers.

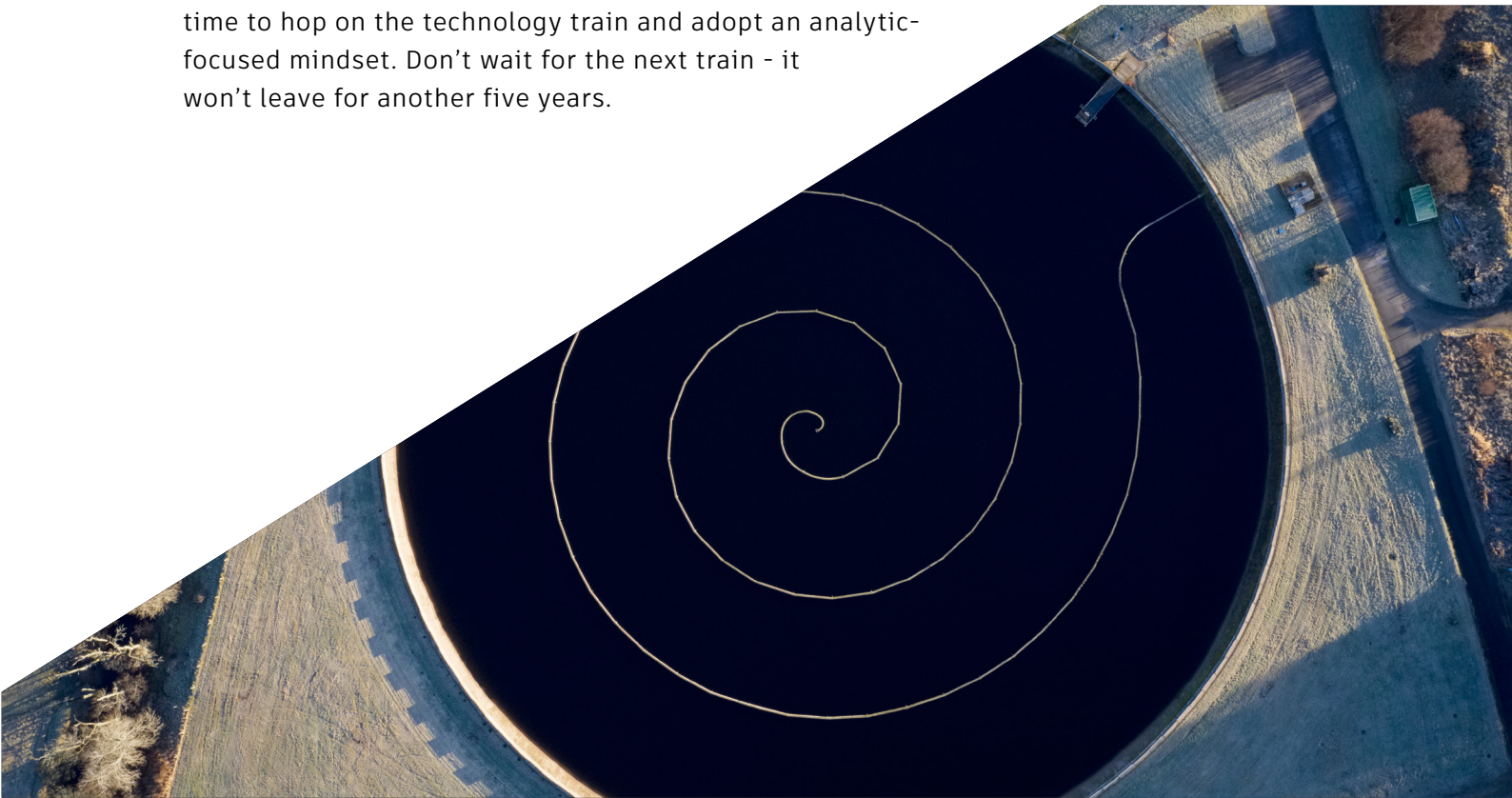
DIGITALISATION

To cite just a few examples, in just the last year alone, our software for water professionals has seen major advances. InfoDrainage added a game-changing Machine Learning Deluge Tool, while InfoWorks ICM (along with InfoWater Pro) adopted lightning-fast cloud simulations, which has removed long-entrenched computer-processing barriers. Now, our customers can run large batches of simulations significantly faster, in minutes instead of hours. We have more tech advances in the pipeline, like adding AI CCTV VAPAR technology to Info360 Asset.

In addition, our water software is becoming more tightly integrated with Esri GIS mapping technologies and with Autodesk AEC Collection apps like Civil 3D and InfraWorks. These integrations have been joined in the past few years by new, next-generation SaaS apps like Info360 Asset for asset management, Info360 Insight for deep operational analytics, and Info360 Plant, which is specifically designed for utility operation efficiencies. We're very excited for these advances that have come relatively quickly, and even more excited about what we will accomplish in the coming years.

While we are bullish on technology, it is true that spreadsheets and hand-written site logs are still all too common in the water industry. Further, those water utilities that are digitally advanced sometimes have a Frankenstein arrangement of systems, which each system separately working to solve an important problem, but which do not communicate with each other effectively. The impact is high costs, time wasted and sometimes even confusion about data accuracy because there are so many sources of data.

We believe these challenges are all solvable by investing in a data-driven work culture. We encourage all water professionals to embrace the digitalisation opportunity that AMP8 provides. Now is the right time to hop on the technology train and adopt an analytic-focused mindset. Don't wait for the next train - it won't leave for another five years.



> “While the water companies acknowledge there is a colossal amount of work to do, we expected to see more pace and innovation in storm overflow maintenance and investment by now. We need to see water companies undertake urgent action, including thorough inspections of those storm overflows with the highest spills, and extensive maintenance programmes of their sewerage networks.
>
> Environment Agency

CSOs

CSOs and better hydraulic modelling

How software can help manage this hardware problem

One of the biggest and most impactful changes in the UK water industry has already been set into motion. The Environment Agency has required all water companies to install Event Duration Monitors (EDMs) on all CSOs, which was completed at the end of 2023. Going forward, EDMs will monitor CSOs every two or 15 minutes, depending on the sensitivity of the receiving water, and EDM data will be collected in an online National Environment Data Hub that will be publicly available for anyone to access.

Utilising sensors to identify problematic CSOs

We strongly recommend that you work to add this sensor data into your hydraulic models.

Plugging this EDM sensor data directly into InfoWorks ICM can help you identify your most high-risk CSOs and start solving for them. If a problematic location is subject to a high frequency of spills, you can help find solutions to that problem with a digital model.

You can assess network options that mitigate the risk of CSO spills in various ways. Having a model that enables you to try different options, such as reducing inflows, adding additional storm tanks, upsizing of pipe capacity and uprating of pumps, can help utilities find the most cost-effective ways of ensuring that the network can continue to deliver the service required, without the risk of incurring possible regulatory fines associated with CSO spills.

The impact of stormwater separation using SuDS can also be modelled. Your newly updated models, with the latest EDM data, can then be used to present both traditional designs and SuDS-based solutions for stakeholders to consider. We believe that including both traditional options that your stakeholders normally choose but also offering multiple SuDS-based options alongside the “usual” options can help make your SuDS-based arguments more attractive. By doing this, you can show stakeholders the gaps that exist between traditional and SuDS-based benefits and associated costs, over both the short and long term, providing them with good reasons to choose new and better designs.

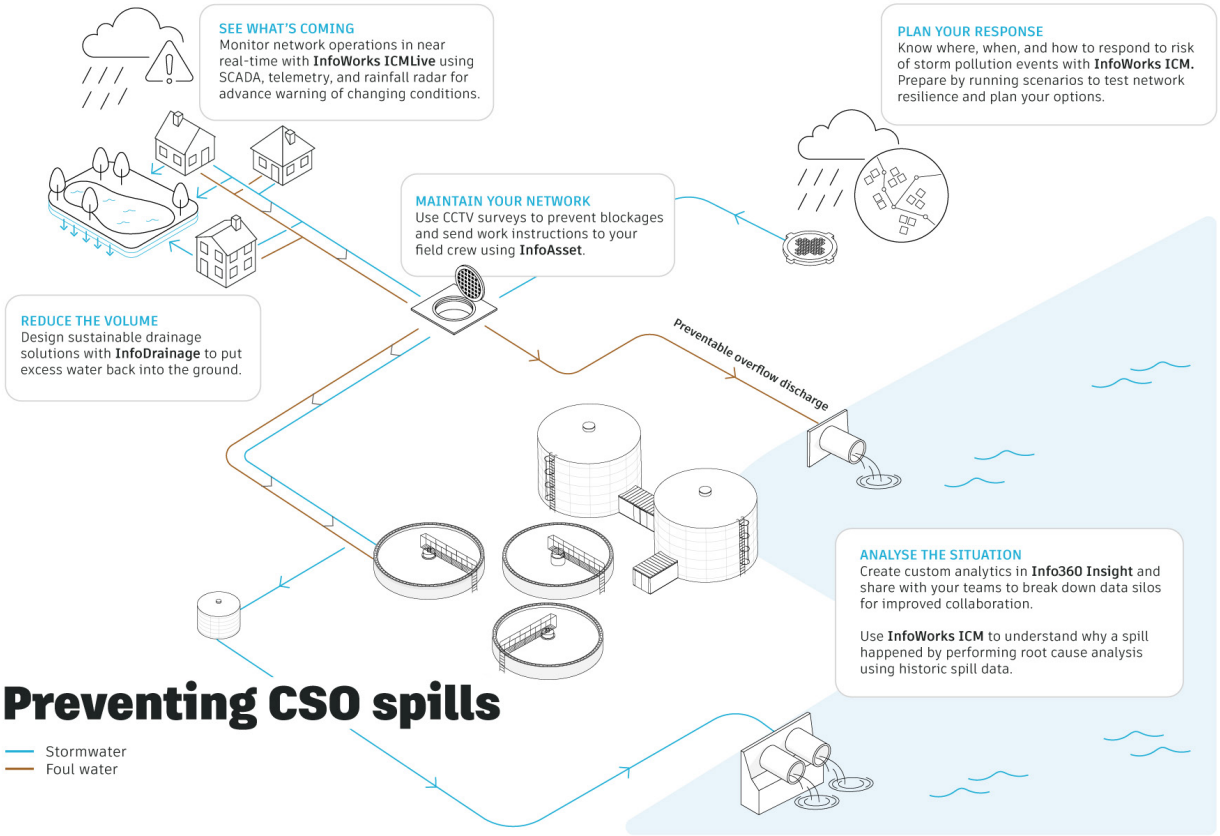
CSOs

What else can you do with EDM sensor data?

As noted, almost every storm overflow should now be monitored by an Event Duration Monitor, which in a few months should be available for public review via the upcoming National Environment Data Hub. While some may grumble about the inconvenience of being tasked with paying attention to new regulations, smart water professionals will immediately see that this new source of data from EDMs has huge potential. As with any new source of data, it's important to think creatively about how you might employ that data for other purposes.

These EDM devices can bring a new urgency to your hydraulic modeling simulations. You can import the EDM data into an InfoWorks ICM model, which can improve verification of your model as a live digital twin. This also provides an opportunity to create a near-real-time working hydraulic model using InfoWorks ICM Live that provides live alerts of spills and sensor issues, giving you a fully proactive point of view so you can excel at preventing CSOs.

It's also important to not view this EDM data as existing in isolation, but as a complement to other sources of trusted data like weather forecasting data, event duration data, flow volumes and water quality impacts. If using digital technology to its fullest potential is your goal, this EDM data can help hone your system, giving you an even more accurate view of your working system, making your CSO modeling predictions even more useful.



CSOs

How hydraulic modelers can predict CSO incidents

Once you have a hydraulic model which incorporates both physical assets and inflow data, you can begin to run simulations using a mathematical engine like InfoWorks ICM, allowing you to accurately predict responses to different weather events and scenarios. There are two basic options when establishing a digital hydraulic model of a sewer network: offline and online.

Offline models

With an offline model, your predicted network response can be generated from observed, assumed, or synthetic data. For utmost accuracy, your model should be calibrated against observed data, which you collect via a flow survey over several months from EDMs placed in many key locations. InfoWorks ICM can ingest this EDM data, and you can fine tune your models with provided regional rainfall/runoff calculations and even include variations based on seasonality, if you wish.

Offline models have a variety of uses, including estimating the effects of new developments via Development Impact Assessments, helping you understand the causes for previous spills and – when used in conjunction with weather forecasts – providing guidance on what may happen in a future scenario. While powerful, offline models are not the answer in every situation.

Online models

Online models offer unrivalled depth of understanding of CSOs. They are especially useful:

- When trying to understand catchments that are prone to regular flooding
- When there is cause for concern around polluting bodies of water further down the line
- Where flooding can provide a significant impact to critical infrastructure

Without the benefit of a calibrated hydraulic model, a utility might underestimate the impact a new scheme will have on the network and consequences later down the line, which could include regulatory fines from additional CSO spills. A further advantage of sewer modelling is the ability to use the proposed capex and opex costs of a flood mitigation scheme in conjunction with the scheme's hydraulic modelling flooding results to derive a cost-benefit analysis and produce the most effective scheme possible.

CSOs

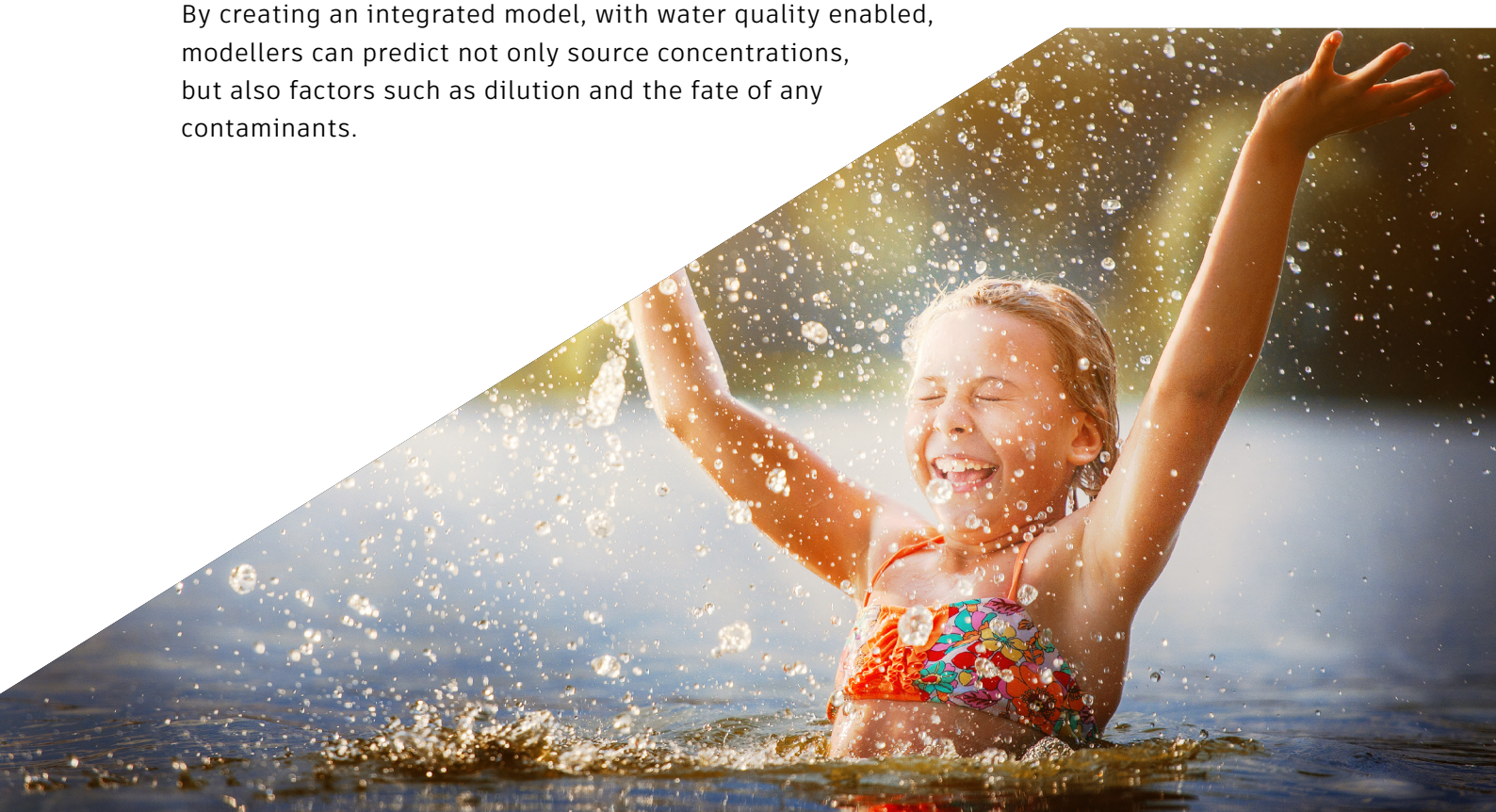
Improving water quality with EDM sensors

Where even greater insights are needed, perhaps in more sensitive areas or areas where there may be several potential sources of contamination to the receiving watercourse, it's possible to develop the model further with either or both of two key model enhancements.

The first enhancement is to add water quality parameters to the sewer network model. This gives the model the capability to predict not only spill volumes and durations, but also the concentrations of water quality determinants such as BOD, ammonia and phosphorus, for example. A water quality model can also have operational benefits. By modelling sediment transport in the sewer network, it's possible to predict where sediment is likely to build up and over what period, which can help inform proactive maintenance routines. Proactive cleansing before a blockage occurs downstream of a CSO could further reduce the risk of spills.

The second enhancement would be to create an integrated model which includes both the sewer network and the watercourse in the same model. This enables the modeller to examine interactions between the sewer network and the watercourse. If there are several CSOs along the same river reach, it's possible to gauge the individual and cumulative impact of the overflows on the watercourse more accurately. If the integrated model is further expanded to include the upstream catchment, it could also be used to represent other contributors, such as agricultural runoff, to gain a more complete picture of all sources of contamination.

By creating an integrated model, with water quality enabled, modellers can predict not only source concentrations, but also factors such as dilution and the fate of any contaminants.



CSOs

Making your DWMP a rolling program of works

Your hydraulic models can be used for long-term planning as part of a Drainage and Wastewater Management Plan (DWMP) to evaluate capacity and assess the resilience of your drainage and wastewater system. But they need not only be thought of as long-term tools for creating 25-year DWMPs. To proactively address CSOs, you will want to consider your DWMP as a rolling program of works and build on the work that you've already done for your most recent DWMP:

1. Create hydraulic models that prioritise and rank CSOs in your network.
2. Compile a list of failing CSOs using the SOAF Storm Overflow Assessment Framework.
3. Develop and compare options to prevent CSO spills.
4. Improve each CSO and your network of CSOs by fine-tuning pumping stations, optimizing existing storage and offering alternative storage based on your models.
5. Add additional storage when and where needed.

Moving away from a reliance on tankering

Building massive tanks to hold raw, untreated sewage – or doing the same thing in a mobile way using tanker trucks – has an important upside and a lot of downsides. The benefit is that it can help alleviate CSOs in emergency situations. But this short-term tactic can become very expensive, particularly when using mobile tankers. You can slowly drain your operating expenses by relying on fleets of trucks, with their environmentally unfriendly engines idling for hours, to hold off CSOs until the weather clears up. This short-sighted practice can start to feel like a long-term, net-negative - a crutch that becomes difficult to discard.

This problem may be, at root, a problem of planning and foresight. Tankering can utilise data by relying on accurate weather forecasting to determine where and when to pump sewage to prevent CSOs, but it is a blunt tool that is difficult to finely tune. Simulation modelling, on the other hand, provides a larger, more systemic perspective that can help you use the power of simulation modelling to programmatically come up with cheaper, more effective, and more natural solutions.

Hydraulic modeling software can help you limit the reliance on tankering to truly emergency situations. You can run many simulations to identify the specific weather conditions, in specific locations, that will trigger a CSO alarm, helping you plan for those emergencies by creating additional water storage that can stand up to your most extreme weather models.

> “There are many sources of pressure to be more sustainable – there’s media pressure, corporate pressure, new regulations, and incentives from the European Commission or governments. Both governments and companies are starting to look beyond just rules and negative financial impact; they’re realizing there’s a lot of economic potential in sustainability. It’s actually creating value and generating a virtuous cycle.
>
> – Jean-Francois Guiderdoni, ACWA Robotics

NATURE-BASED SOLUTIONS

Biodiversity Net Gain: 3 ways to succeed

A change that makes society better is one we can all be proud of

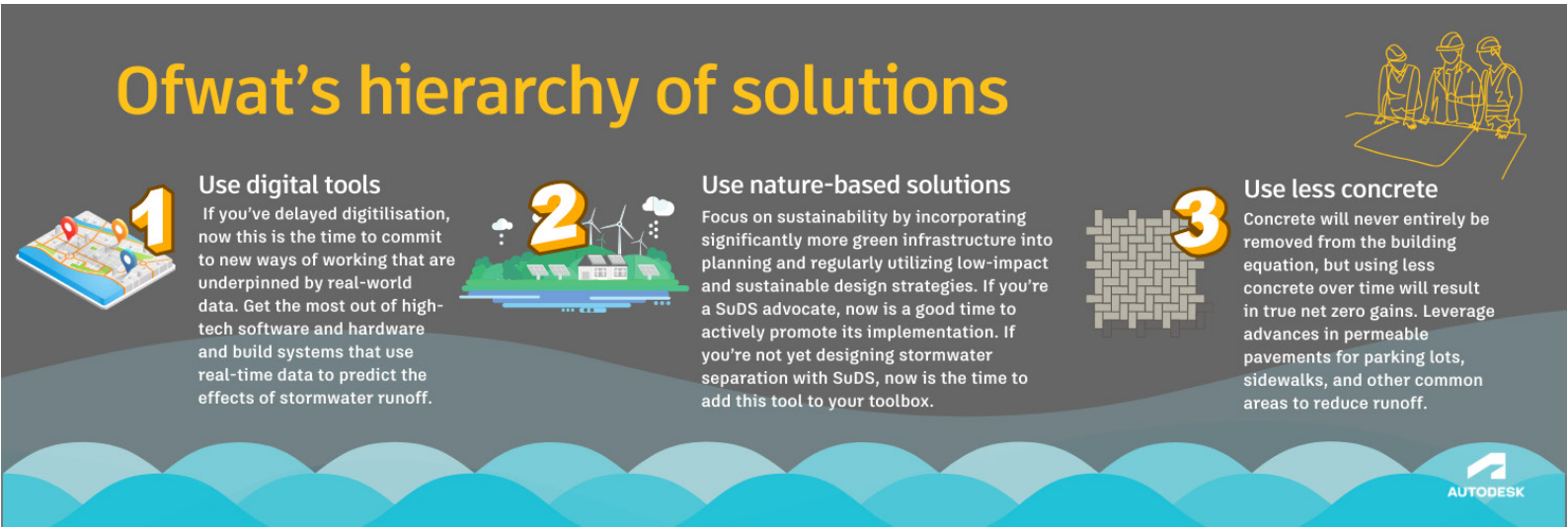
According to the UK government, developers must now deliver a minimum Biodiversity Net Gain (BNG) of 10%. This means a development should result in more or better-quality natural habitat than existed before development began.

There are essentially three ways a developer can achieve 10% BNG:

1. Enhance and restore biodiversity directly on-site, or optionally on other land they own.
2. Pursue a mix: on-site biodiversity improvements plus off-site Biodiversity Units purchased from a land manager.
3. As a last resort, buy statutory biodiversity credits from the government, the proceeds of which go to habitat creation across England.

While some developers may initially see BNG requirements as a burden, they are a means to a very positive end. They improve a development so that it works in closer harmony with the environment, which can be a very strong selling point for a development scheme.

The best way to satisfy this requirement is to make SuDS a regular and essential part of your on-site project planning. When you're able to offer stakeholders multiple SuDS options to satisfy BNG requirements, you open the door to compromise for stakeholders, who may, in fact, welcome the opportunity to do things differently. This is ultimately what regulators want: a more thoughtful approach that does not apply the same decision-making calculus for every project, and which balances financial concerns with environmental goals.



NATURE-BASED SOLUTIONS

Drainage design: SuDS is the future

We have been focused on building SuDS features into InfoDrainage for many years, with the belief that nature-based solutions would become an increasingly essential and necessary approach to site design and development. We're confident that we've built the leading industry approach to designing SuDS-based landscapes, and we encourage our existing customers to dive deeply into these opportunities by utilising the many SuDS options inside InfoDrainage.

We want to make it easier for water professionals to incorporate nature-based design by offering a 30-day free trial of InfoDrainage. If you're an existing Microdrainage user, we have lots of reasons why you should upgrade and plenty of resources to help you upgrade to the latest technology. If you are completely new to SuDS, we even have an excellent introductory video: Understanding SuDS Design.

The future will be SuDS-y

We built InfoDrainage with Storm Water Control (SWC) options so you can easily drop SuDS-compliant drainage into your designs. Get our "Guide to Representing SuDS in InfoDrainage" which is based on the CIRIA Manual (753).

The problem with relying solely on offsets

In addition to AMP8's heavy focus on digitalisation and CSOs, we must not forget the promises and goals of AMP7, which focused on Net Zero goals and leaned heavily into carbon offsets to kick-start industry momentum. While they have a place in any water company strategy, relying solely on carbon offsets could become a hindrance to future societal progress:

- Prioritising the reduction of greenhouse-gas emissions is central to the achievement of Net Zero, particularly since the scale of emissions reductions needed to achieve Net Zero is greater than the offsets available.
- A reliance on offsets can hinder innovation and the growth of a circular economy by allowing poor and inefficient practices to persist, distracting from the long-term solutions needed to reduce emissions.
- The government wants to encourage sound investment decisions and steer companies to focus on process changes and technological innovation to address emissions problems. Allowing poorly substantiated offsets risks undermining this goal.

In the past, the construction industry has usually gone straight to pouring concrete, but it's becoming increasingly clear that nature-based solutions can be an important bridge to the future of our built environments. They don't just satisfy legal requirements and encourage more future-forward ways of building, they can solve some drainage problems in remarkably simple, sustainable, and easy-to-understand ways.

Perhaps most importantly, the world seems to have finally woken up to the realisation that more SuDS makes the liveable landscape better for citizens by adding greenery and putting more emphasis on the human aspect of built spaces. If you believe in SuDS, now is not just the time to be vocal about it, but to potentially get rewarded for your advocacy.

Sustainability is a bigger trend than most realise

One last point about the importance of sustainability: Water companies who resist sustainability initiatives may find themselves losing significant ground to competitors in the water industry when it comes to attracting the next generation of water workers.

Autodesk's most recent 2024 Design & Make report surveys water professionals, along with a broad swath of other infrastructure workers. This yearly report is designed to identify trends, and this year's survey results makes one thing abundantly clear: "pride in the work that we do" is one of the most important aspects around sustainability for employers.

These are perhaps the most important trends that HR departments should pay attention to as they plan for the future.