2024

DETECTION SERVICES
PIPELINE INSPECTION AND ANALYSIS

Preparing and Reacting to Major Flood Events

A resource for water utilities in New Zealand.

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FLOODING IN NEW ZEALAND

New Zealand is no stranger to the impact of recurrent flood events that sweep through its diverse landscapes. Despite the breathtaking beauty of its geography, the nation grapples with the sobering reality of how these floods affect its intricate water networks, posing complex challenges for water utilities and significantly impacting end consumers.

The consequences of flood events in New Zealand have a profound impact on various aspects of the water network, presenting a range of challenges. One of the most immediate and critical issues that arises is the compromised water quality, making it unfit for consumption. Floodwaters often introduce pollutants, sediments, and contaminants into water sources, potentially affecting the quality of the water supplied to households and industries. This not only poses health risks but also requires extensive treatment measures, placing strain on resources and infrastructure.

Moreover, the inundation into wastewater networks exacerbates the situation. Inflow and infiltration into these systems due to flooding lead to overflows, system blockages, and potential contamination of surrounding areas, posing environmental hazards and health concerns. The ripple effect of floodwaters infiltrating wastewater networks amplifies the challenges faced by water utilities, necessitating immediate and robust mitigation strategies.

The loss of water supply due to these inundations compounds the crisis, especially when water storage facilities are compromised or depleted. Floods disrupt the normal functioning of water storage facilities, leading to reduced capacity and potential structural damage, intensifying the strain on water supply systems. This, coupled with heightened demand during and post-flood events, adds to the challenge of ensuring a consistent and reliable water supply to consumers in New Zealand.

Moreover, flood events often wreak havoc on communication networks, hampering the ability of water utilities to respond effectively and disseminate crucial information. The loss of communication infrastructure not only impedes the coordination of response efforts but also affects the dissemination of critical advisories to consumers, worsening the impact of the crisis.

However, amid these challenges lie opportunities for proactive measures and solutions to mitigate the impact of flood events on the water network. By embracing innovative technologies, implementing robust infrastructure designs, and formulating comprehensive risk management strategies, water utilities can fortify their networks against the adverse effects of floods. From early warning systems to resilient infrastructure designs and community engagement initiatives, a proactive approach can minimise disruptions, safeguard water quality, and ensure the continuity of water supply during and after flood events.

This document aims to delve deeper into these challenges faced by water utilities in the wake of flood events in New Zealand. By exploring the various dimensions of impact and proposing viable solutions, it seeks to equip stakeholders with insights and strategies to bolster the resilience of water networks, ensuring a more resilient and adaptive approach in the face of future flood events.

IMPACT ON WATER QUALITY

Floods, while a natural phenomenon, can significantly compromise the quality of water in mains networks, posing a critical concern for water utilities.

One of the primary repercussions of floods is the influx of contaminants into water sources. Heavy rains and rising waters carry debris, sediments, agricultural run-offs, and pollutants, infiltrating reservoirs and catchment areas. As these contaminants seep into the mains networks, they pose a grave threat to water quality. Sedimentation can clog pipes and reduce flow rates, while chemicals and microorganisms can lead to microbial contamination, making water unsafe for consumption.

The integrity of water treatment processes can also be compromised during floods. Overwhelmed treatment plants may struggle to handle the sudden influx of pollutants, leading to inadequate purification and disinfection. This can result in a heightened presence of pathogens, organic matter, and dissolved solids, rendering the water undrinkable and unsafe for end consumers.

THE SOLUTION

To safeguard water quality and protect consumers, proactive measures become indispensable. Implementing robust monitoring systems, enhancing resilience in infrastructure, and devising contingency plans are imperative steps for mitigating the far-reaching implications of flood events on water quality within mains networks. By fostering a proactive approach, Australian water utilities can fortify their systems, ensuring the delivery of safe and clean water to communities even in the face of nature's fury.

NO-DES is an innovative and effective way of cleaning water mains with virtually no loss of water. It delivers a cost-effective solution to traditional methods of cleaning water mains. This technology increases customer confidence, reduces operational costs and conserves water and environmental discharge.

Traditionally, water pipes have been flushed by opening fire hydrants and letting water discharge out into the street. The NO-DES system saves this water by attaching to two fire hydrants and creating a temporary above ground loop through which the water is circulated, cleaned and returned to the pipe. The NO-DES machine flushes the water between the hydrants at a velocity that intentionally stirs up the sediments, and then removes them in the purpose built NO-DES filters. **Why choose NO-DES?**

- It requires no shutdown of the water supply.
- It is a no disruption, efficient, effective way of cleaning water pipes.
- Minimal disturbance to customers supply (unlike conventional flushing), as NO-DES does NOT require the pipe to be de-pressurised or supply to be turned off.
- It is self-contained, with no water flushed down the street.
- It works using very high velocities.
- It filters and re-circulates the water inside the pipes (down to one-micron absolute - approx. 100 times smaller than the diameter of a human hair).
- It is a controlled flow providing for reduced damage - no water hammer or pipe/lining erosion.
- Conserves two vital natural resources — water and the energy it took to produce and pump it.
- Water quality is not compromised with the addition of Chlorine back into the supply if required.
- Ultraviolet treatment is also available.

INUNDATION INTO WASTEWATER NETWORKS

When floods strike, they can inundate wastewater systems, leading to a cascade of issues that impact both infrastructure and the environment.

Firstly, inundation can overwhelm sewage treatment plants, causing them to malfunction or even fail. This can result in untreated or partially treated sewage being released into waterways, posing serious health risks to communities and ecosystems. The contamination of water sources can lead to the spread of waterborne diseases, environmental degradation, and harm to aquatic life.

Moreover, floodwaters can damage critical components of the wastewater network, including pipes, pumping stations, and treatment facilities. Corrosion, erosion, and structural damage can occur, requiring extensive repairs or replacements. The disruption to these systems can lead to service disruptions, affecting residential, commercial, and industrial areas, causing inconvenience and economic losses.

Furthermore, the infiltration of floodwater into sewage systems can overload the capacity, causing backups and overflows in residential areas. This not only damages property but also poses health hazards by exposing people to raw sewage.

To mitigate these impacts, water utilities must focus on proactive measures such as investing in resilient infrastructure designs, implementing early warning systems, improving emergency response plans, and conducting regular maintenance and upgrades. By enhancing the resilience of wastewater networks, utilities can better withstand flood events and minimise the detrimental effects on communities and the environment.

THE SOLUTION

Providing infiltration and inflow solutions requires an inspection and maintenance strategy. Detection Services has the technologies to provide innovative solutions for wastewater pipelines and networks.

- Sonar, laser profiling, CCTV surveys.
- Pressure and flow change data analysis.
- Monitoring real time (24/7) or daily monitoring.
- Infiltration and Inflow (I&I) investigations and analysis.
- Pipeline condition assessment.
- Location of internal blockages and debris within the pipeline.
- Location of defects— corrosion, cracks, and sediment build-up.

iTracker Smart I&I Detection
iTracking®, along with its groundbreaking Computer Generated Imagery technology (Playback®), is poised to transition the complexities of Inflow and Infiltration (I&I) detection from a difficult and expensive process to one that is simple and inexpensive.

With a click of the Playback® button, users are immediately presented with an animated video showing the relationship between wastewater levels and weather events leading up to the I&I episode in question. Specifically developed algorithms quickly isolate and determine those sites responsible for the highest volumes of I&I. Each problematic site is then encircled with a “red ring” for quick identification. I&I is isolated to within adjacent monitored sites.

iTracker Smart I&I Detection sensors are packed with powerful features that give you the ability to monitor, analyse and alert on a single platform. Designed with both Bluetooth and cellular capability, sensors can be deployed in just 20 minutes, do not require confined space entry and are maintenance-free.

- Non-Contact | Lightweight: 1.9lbs | Bluetooth & Cellular Enabled
- 12 Month Battery Life | (2) - 3.6v Lithium D Cell | Onboard Data Logger

"In times of severe weather events, we stand shoulder to shoulder with water utilities and councils across New Zealand, committed to supporting your response and providing solutions that are both innovative and effective. Our partnership is unwavering, ensuring reliable support and proactive measures. We are dedicated to working with you, safeguarding communities and their vital water resources."

Chris Evans, Chief Operations Officer

WATER SUPPLY AND LOW STORAGES

Flood events in New Zealand wield a double-edged sword when it comes to water supply, impacting both abundance and scarcity. While they bring a surge of water, they also trigger challenges for water utilities. Intense floods can lead to soil erosion, contaminant runoff, and infrastructure damage, compromising water quality and treatment processes. Sedimentation in reservoirs reduces storage capacity, impeding the collection of water during subsequent rains.

Moreover, floodwaters, despite their volume, often don't align with catchment areas or storage systems, causing inefficiencies in water collection. This mismatch between flood timing and water demand creates operational hurdles for utilities, potentially resulting in low storages during critical periods.

Asset managers and engineers must proactively assess and fortify infrastructure resilience, including treatment plants, pipelines, and storage facilities. Implementing robust sediment management strategies, diversifying water sources, and leveraging advanced forecasting models can mitigate these impacts. By integrating adaptable measures and enhancing system flexibility, water utilities can navigate flood-related challenges, ensuring reliable water supply despite the tumultuous nature of New Zealand weather.

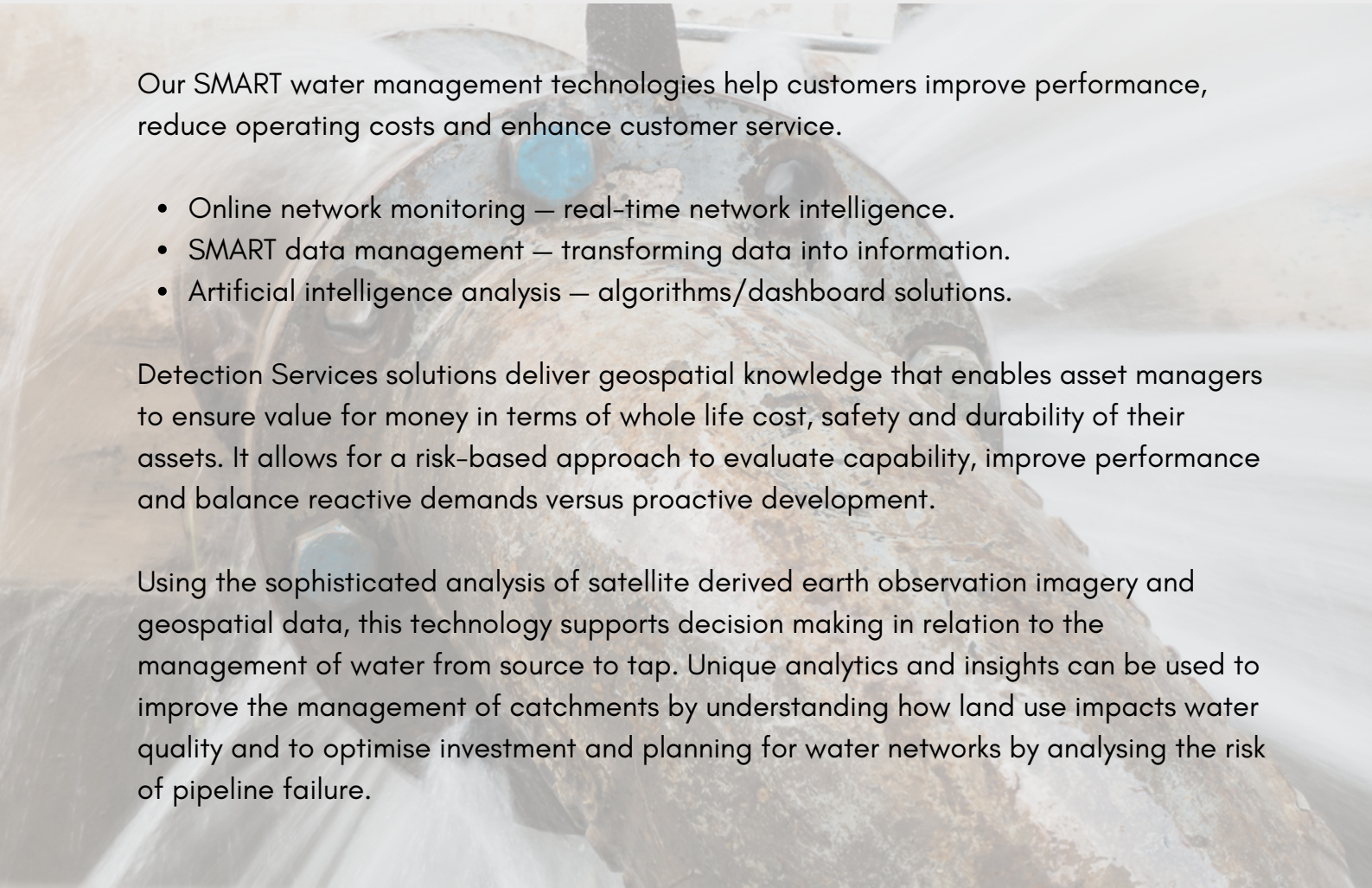
Protecting the pipeline is integral to ensuring a high quality water supply. Pipeline leaks can have serious consequences including damage to the environment, property, reputation and safety. Leakage can contribute to a large proportion of non-revenue water (NRW) loss and this has a direct cost to the operation of the system including water quality rating and pipeline deterioration. Advances in water loss management solutions, including digital leak detection technology, network monitoring and water auditing offer innovative opportunities for tackling leak detection.

THE SOLUTION

The most cost effective and efficient method of managing your reticulation leakage is a staged approach. Firstly, experienced leakage technicians acoustically test all your reticulation assets, including meters, stop taps, hydrants, valves, air valves etc. for evidence of the leakage. Secondly, digital correlation logging (DCL), noise correlation and noise logging are used to localise the leak, which is then confirmed by ground acoustics. This approach maximises results and accuracy with pinpoint leakage reporting.

Identifying leaks as a priority is vital to reduce disruptions, minimise risk and retain control of pipeline networks. Our specialist water loss management solutions include: Our SMART water management technologies help customers improve performance, reduce operating costs and enhance customer service.

- Acoustic leak detection
- Meter audits and calibrations
- PMA design and implementation
- NRW water investigations and strategies
- DMA leakage studies
- Minimum night flow monitoring (MNF)
- Trunk main leak detection and analysis
- Acoustic and multi-parameter monitoring



Our SMART water management technologies help customers improve performance, reduce operating costs and enhance customer service.

- Online network monitoring – real-time network intelligence.
- SMART data management – transforming data into information.
- Artificial intelligence analysis – algorithms/dashboard solutions.

Detection Services solutions deliver geospatial knowledge that enables asset managers to ensure value for money in terms of whole life cost, safety and durability of their assets. It allows for a risk-based approach to evaluate capability, improve performance and balance reactive demands versus proactive development.

Using the sophisticated analysis of satellite derived earth observation imagery and geospatial data, this technology supports decision making in relation to the management of water from source to tap. Unique analytics and insights can be used to improve the management of catchments by understanding how land use impacts water quality and to optimise investment and planning for water networks by analysing the risk of pipeline failure.

LOSS OF COMMUNICATIONS NETWORKS

Floods in New Zealand present a formidable challenge to communication networks, critically impacting water utilities and their operations. When floods strike, they can sever communication lines, disrupting vital connections between water management systems and utilities. This loss of communication infrastructure hampers real-time monitoring, control, and coordination, impeding swift responses to crises.

For water utilities, this breakdown in communication means compromised situational awareness. Inaccessible data about water levels, pipeline integrity, and treatment processes hinders effective decision-making. Asset managers and engineers face heightened difficulties in assessing infrastructure damage and allocating resources efficiently.

Mitigating these impacts requires robust contingency plans. Implementing redundancies in communication systems, leveraging resilient technologies, and establishing alternate channels for data transmission are crucial steps. Additionally, investing in predictive analytics and remote monitoring tools can enable proactive risk assessment and faster response during emergencies.

Ultimately, fortifying communication networks against flood-related disruptions is pivotal for water utilities, ensuring continuity in delivering essential services to communities across New Zealand.
Detection Services provides multiple solutions to restore communication from water and wastewater networks or provide temporary monitoring across flow, pressure, level and water quality parameters.

THE SOLUTION

Asset monitoring is aimed at achieving organisational long-term goals and effectiveness through alignment of the infrastructure assets to meet the changing environment and customer's needs.

Monitoring of critical pipelines provides an advanced early warning system to evaluate the operating conditions of the pipeline network and minimise disruption to supply. Monitoring can be immediate (real time) or daily depending on critical evaluation.

Customised programs and technologies are combined for a solution tailored to the customer's specific requirements. This allows for early warning of risks such as leaks, corrosion, acoustic distortion, flow variations and pressure changes along the full extent of your pipeline. It minimises potential threats such as a catastrophic mains failure.

Data quality, consistency, accuracy and timely delivery are paramount to a successful project and we use only the highest resolution monitoring equipment available. Our asset monitoring system and technologies allows for optimising risk management, resources, production efficiency and is a vital component in pipeline asset management.

Our services are designed to address the lifecycle of resource and infrastructure assets and include:

- PMA/DMA validation
- Energy efficiency monitoring (Pumps and Blowers)
- Damaging Transient pressure identification
- PRV installations and monitoring
- Valve exercising and monitoring
- Reservoir level and SCADA monitoring
- Infiltration and Inflow investigations and analysis
- Acoustic, pressure and flow change data analysis
- Field data collection for hydraulic model calibration
- Monitoring real time (24/7) or daily monitoring
- Geospatial artificial intelligence for network prioritisation
- Customised programs and technologies including AI powered leak detection
- Data interpretation, establishing system profiles and alarm thresholds
- In situ meter verification to determine accurate flow demand and profile

FOR INQUIRIES, GET IN TOUCH.

detectionservices.co.nz

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