

SIYTE for Flood Monitoring

Enhancing Safety & Operational Efficiency

Flooding is a major challenge for UK rail infrastructure - increasingly disrupting service, damaging assets and threatening passenger safety, as outlined in the Weather Resilience and Climate Change Adaption (WRCCA) plans for Control Period 7. The need for an efficient, effective flood monitoring and management system has never been more pressing.

Within the UK Rail WRCCA programme, approximately £540 million will be invested in drainage improvements alone. Yet, despite the high costs of flooding-related delays, many of these investments lack the necessary monitoring to help Route Control and asset teams assess drainage performance, detect issues such as blocked trash screens or predict when services may be disrupted.

Our SIYTE platform transforms how drainage systems are managed by unifying data from multiple, disparate sources into one intelligent view. The result is clearer visibility, enhanced situational awareness and predictive insights to support faster, data-driven decision-making.



SIYTE was deployed at Chipping Sodbury between Swindon and Bristol, using a combination of new and existing sensors and cameras. This deployment enabled asset teams to understand the system better, providing crucial insights to operate the site and train performance more effectively.

By viewing the site as a whole-system, the asset strategy team were able to understand how the different assets integrate. Together with other measures to improve asset performance, an estimated 7,000 minutes of delays were avoided in the Winter of 24/25 compared with similar events the previous year.

Modern monitoring systems should not only measure the success of drainage upgrades, but also identify early signs of failure, detect blockages and provide continuous performance feedback. However, traditional systems are often fragmented and reliant on manual processes - slowing responses and obscuring visibility of developing risks.

The cost to Network Rail from weather related events over the past 15 years has been at least £3bn in delays and cancellations, insurance claims and autumn preparation. The reduction in our performance caused by such weather events has a negative impact on our passenger and freight customers and inhibits our ability to deliver on the governments' targets. The impact of extreme weather can vary significantly year-by-year; delays and cancellations cost £50-100m per year.

Network Rail Asset Management Weather Resilience and Climate Change Adaptation Plan 2021

SIYTE overcomes these challenges by bringing together data from cameras, IoT sensors and third-party sources into a unified platform that delivers real-time insights and automated alerts - helping rail operators strengthen resilience, safety and operational reliability.

Impact of Flooding



Operational Disruption: Flooding can block railways and cause significant delays, leading to poor customer experience and lost revenue.



Infrastructure Damage: Floodwaters can cause damage to tracks, bridges, signalling systems, and associated equipment - resulting in costly repairs and additional delays.



Safety Risks: Flooding poses serious safety concerns for both passengers and workers, necessitating prompt action to mitigate risks.

Challenges of Traditional Monitoring

Traditional monitoring approaches are often disjointed and manual, with independent systems creating fragmented data streams and limited visibility. Reliance on site visits and manual reporting delay response times, increases costs and reduces the ability to act proactively.

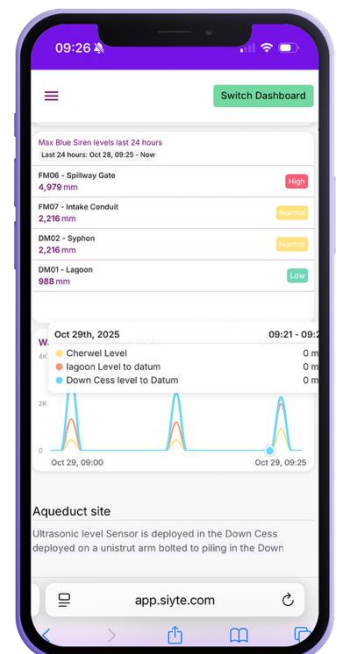
System Overview

SIYTE provides an end-to-end Flood and Environmental Awareness solution, offering a unified platform that integrates live and historical data from multiple sources into a single interface. Teams can instantly access and analyse information across rainfall, groundwater, river and culvert levels, temperature, humidity, pump activity and more.

Data Aggregation

SIYTE consolidates data from cameras, IoT sensors, programmable logic controllers (PLCs), and third-party sources - creating a complete picture of flood conditions across sites and the wider network.

- **CCTV cameras** provide real-time visual awareness and AI-assisted image analysis to detect flooding and anomalies.
- **IoT sensors** monitor flow, water level, rainfall and pump performance - sending data continuously for proactive risk management.
- **PLCs** enable automated responses such as activating pumps.
- **External data sources** such as the Environment Agency, Met Office or local river trusts enhance predictive accuracy and situational awareness.



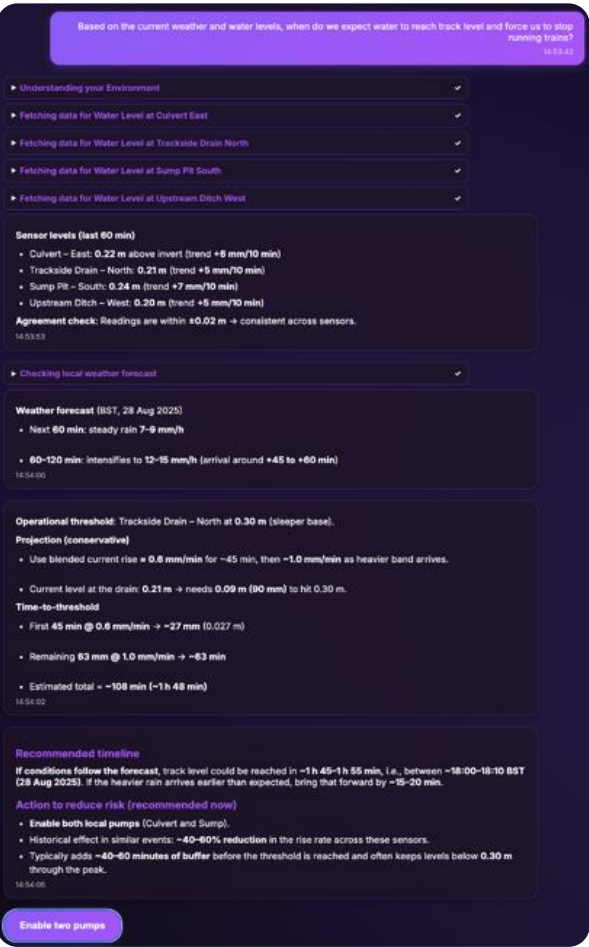
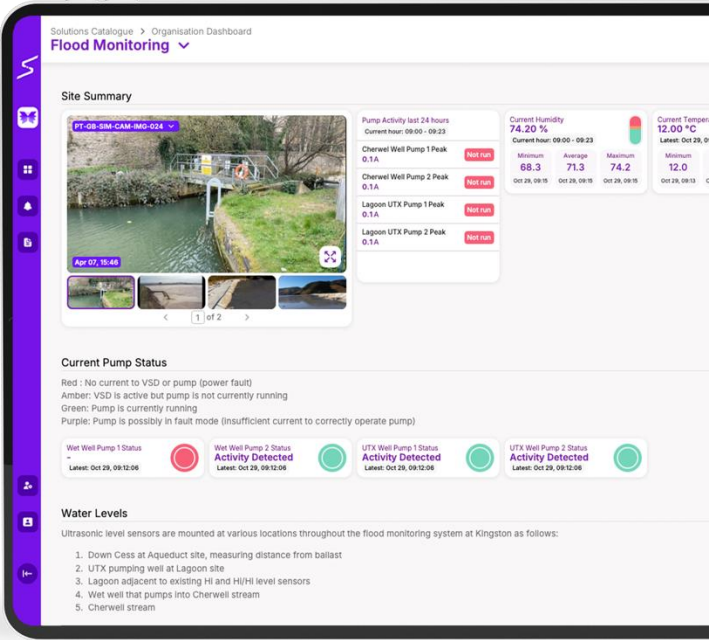
Unified Interface

SIYTE’s modular, configurable interface enables operators to visualise live and historical data, tailoring dashboards for specific roles, whether for Route Control, asset management or compliance teams. Mobile access allows field staff to view insights and respond in real-time.

Workflow and Alerting

Automated alerts are triggered when thresholds are breached, notifying teams through dashboards, SMS, email or the mobile app. Alerts include contextual data such as sensor readings and camera images, ensuring rapid understanding and response.

A no-code workflow builder allows any data combination to trigger an alert, for example, when rainfall exceeds a set level and the forecast predicts further precipitation.



Advanced Analytics

Machine learning and AI algorithms continuously analyse data, detecting anomalies and predicting flood risks. Historical pattern analysis improves forecasting and supports data-driven decision-making. Operators can also use SIYTE AI, a conversational agent, to query system data directly (e.g. “Give the current rate of change and weather forecast, at what time will water reach the rail head?”).

Business Benefits

- Whole-System Visibility:** Unifies all relevant data into one platform for comprehensive understanding and faster, better-informed decisions.
- Cost Reduction:** Enables remote monitoring and early detection of blockages, reducing the need for manual inspections and costly emergency repairs.
- Improved Response Times:** Provides real-time alerts to Route Control and wider teams, helping prevent service disruption.

Predictive Analysis: Anticipates flooding events and models time-to-impact, allowing operators to take preventive action.

Regulatory Compliance: Supports adherence to environmental and safety standards with continuous monitoring and audit-ready records.

Sustainability: Promotes proactive flood management, protecting communities, assets, and ecosystems while supporting long-term resilience.

Implementation Approach

We deliver an end-to-end flood monitoring solution - combining technology, advisory services and deployment expertise to deliver measurable outcomes.

- **Site Assessment:** Evaluate existing monitoring assets and identify high-risk areas along with existing devices that can be integrated into SIYTE.
- **Sensor Deployment:** Deploy a LoRaWAN wireless network with long-range, low-power IoT sensors via secure protocols to provide multi-kilometre covers and battery life of up to 10 years.
- **Camera Integration:** Install smart situational awareness cameras, powered by PoE or solar, integrating new and existing CCTV video edge devices into the platform for real-time monitoring and enhanced analysis.
- **Dashboard Setup:** Configure user-specific dashboards and reporting tools.
- **Alerting Workflow:** Define triggers and notification channels for relevant stakeholders.
- **Training & Testing:** Equip staff with platform training, run simulations and calibrate alerts to ensure reliable performance.

Conclusion

SIYTE represents a transformative step forward in flood monitoring and management. By integrating real-time data from cameras, sensors and third-party systems into a unified platform - it enables the rail industry to predict, prevent and respond to flooding events more effectively.

The solution enhances operational efficiency, improves passenger safety and delivers measurable cost savings - helping Network Rail and other operators strengthen resilience against climate change and extreme weather while upholding the highest standards of safety and service.

Our goal is to deliver outcomes, not just technology - providing advisory, deployment and ongoing monitoring to ensure every project achieves its intended results.

Explore the case study on our website to see how we supported Wales & Western at Chipping Sodbury.