



STORMHARVESTER[®] INTELLIGENT SEWER SUITE

Wastewater optimisation using machine
learning and hyperlocal rainfall forecasting

stormharvester.com



StormHarvester Intelligent Sewer Suite offers a range of benefits for organisations managing sewer networks and wastewater treatment works.

Our machine learning and hyperlocal rainfall forecasting gives each asset the ability to 'look several hours into the future'. When it is possible to 'see several hours into the future' at asset level, asset duty cycles can be improved to optimise asset and system performance.

Intelligent Sewer Suite benefits include:

- Reduce both individual asset and full network operational expense
- Identify restrictions, blockages and asset underperformance. This enables predictive, condition-based maintenance and reduced combined sewer overflows (CSOs), pollution and flooding events
- Increase wastewater treatment network compliance levels
- Boost overall network performance and resilience



ACCURATE PREDICTIONS OF
SEWER LEVELS AND FLOWS



EARLY DETECTION OF
BLOCKAGE FORMATIONS



IMPROVED NETWORK
PERFORMANCE & RESILIENCE



SEAMLESS INTEGRATION
WITH SCADA SYSTEMS



EASY REPORTING AND
COMPLIANCE



NO ADDITIONAL SENSORS OR
FLOW METERS REQUIRED

Intelligent Sewer Suite is a fundamentally new way to address sewer flows, blockage formation and management of your network.

By combining data from wastewater network with rainfall predictions, Intelligent Sewer Suite's machine learning technology gives unprecedented accuracy in combined sewer overflow (CSO) and pollution/flooding

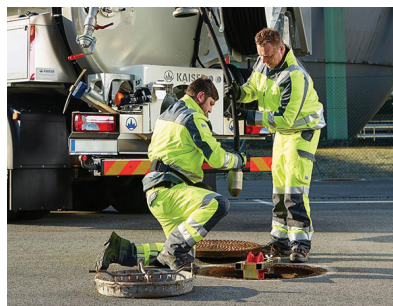
event predictions, as well as a range of other benefits in network management performance analysis, and reporting. Using Intelligent Sewer Suite to manage pump operation enables the improved sequencing to utilise network capacity. This leads to reduced combined sewer overflows (CSOs), reduced pollution/flooding events and greater network resilience.

The Intelligent Sewer Suite Modules.



Smart Flow Predictor.

Accurate predictions on inflows and levels in sewer networks, pumping stations and wastewater treatment works.



Early Blockage Detector.

Early detection of blockages to enable predictive, condition-based maintenance and improved visit efficiency across sewer networks.



Enhanced Network Manager.

Enhanced management of wastewater networks to reduce combined sewer overflows (CSOs), regulate flows, reduce energy consumption and carbon footprint.

STORMHARVESTER®

INTELLIGENT
SEWER SUITE

Smart Flow Predictor.

Accurate predictions on inflows and levels within sewer networks, pumping stations and wastewater treatment works.

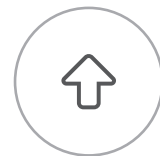
Smart Flow Predictor.

Smart Flow Predictor is a module of Intelligent Sewer Suite that allows accurate predictions on upcoming flows or levels at the following locations;

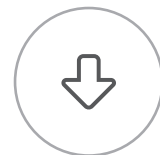
- Individual points in a sewer network
- Pumping stations
- Wastewater treatment works

By leveraging hyperlocal accurately forecasted rainfall prediction systems, the flow and level predictions are accurately provided in both wet and dry weather conditions across the sewer network.

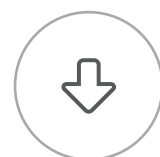
Accurate flow and level predictions provide opportunities for sewer assets and wastewater treatment works to become 'smart' by pre-empting rather than reacting to events.



INCREASE ASSET/SYSTEM
EFFICIENCY



REDUCE ASSET/SYSTEM
ENERGY USAGE



REDUCE CARBON
FOOTPRINT

WASTEWATER TREATMENT WORKS PROCESS OPTIMISATION

Smart Flow Predictor gives wastewater treatment assets and operators the ability to 'look several hours into the future'.

When assets and operators have the ability to see into the future, pre-emptive actions may be taken to optimise performance across the treatment process;

- Chemical dosing processes when future inflow volumes are predicted with high confidence
- Screens can be cleaned and prepared before peak flows arrive
- Separator performance can be optimised based on upcoming inflow rates
- Storm tanks can be made ready when the treatment works pass forward flows are predicted to be exceeded
- Aeration and blower activities can be optimised based on predicted incoming volumes.
- Sediment tanks can be prepared when shock loads are predicted



PUMP OPTIMISATION

A step-change in pump optimisation is now possible. Pump performance can be dramatically improved because these assets can now 'see several hours into the future' using StormHarvester's predictive capabilities. Pump efficiency can be greatly improved by;

- Deferring pumping when low flows are anticipated, and maximising pumping during low energy tariff periods
- Pumping earlier when high flows are predicted and preparing the pumping chambers before increased inflow onset
- Regulating flows across the network using flow predictions

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SEWER SUITE**

Early Blockage Detector.

Early detection of restrictions and blockages to enable predictive, condition-based maintenance across sewer networks

Early Blockage Detector.

The Early Blockage Detector is a module in Intelligent Sewer Suite which detects rapid forming restrictions and blockages across sewer networks before they turn into a network outage. It provides a platform to monitor all sewers in a network using existing level and flow sensors.

By using the StormHarvester Early Blockage Detector, duty controllers will no longer be overwhelmed by the high numbers of control room alarms during wet weather events.

This module silences alarms for consented events and only provides alarms/alerts for unconsented events so maintenance crews can quickly be directed to incidents of greatest impact. This enhances the controller's ability to deploy operational resources to best effect, minimising network outages.



NO ADDITIONAL
LEVEL / FLOW
SENSORS REQUIRED



INTEGRATES WITH
EXISTING SENSORS

HOW IT WORKS.

The Early Blockage Detector works by using StormHarvester's machine learning level prediction software to create safe operating windows for each sewer level monitor, across the sewer network. In the scenario where either the upper or lower threshold of this operating window is breached, near real-time alerts for a possible blockage/anomaly are delivered. Specific alerts enable rapid response, recovery and repair activities reducing network outages and their potential environmental impact.



ADVANCED
MACHINE LEARNING
ANALYTICS



EARLY DETECTION
OF BLOCKAGE
FORMATIONS



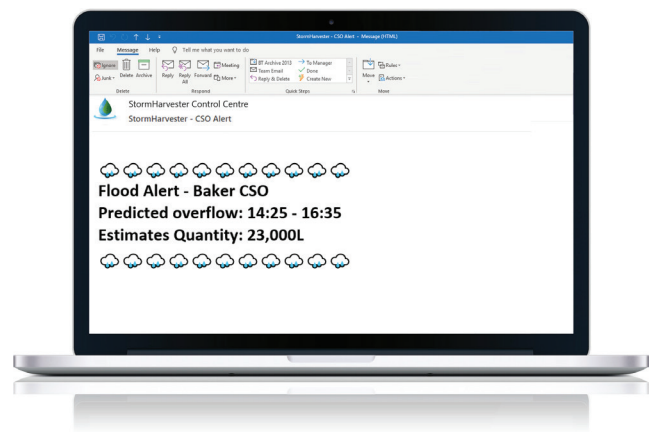
AUTOMATED API,
SMS AND EMAIL
WARNINGS



IMPROVED
EMERGENCY CREW
EFFICIENCY



SMS: Near real-time predictions and alerts



Email: Near real-time predictions and alerts

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**INTELLIGENT
SEWER SUITE**

Enhanced Network Manager.

Enhanced network management of wastewater networks reduces combined sewer overflows, regulates flows and reduces energy consumption.

Enhanced Network Manager.

The Enhanced Network Manager module uses machine learning to predict outages and enables the improved management of the assets in the network to reduce combined sewer overflows and pollution-flooding events.



30% REDUCTION
ON CSO
DISCHARGE



1/8TH COST
OF CAPITAL
UPGRADES

StormHarvester's Enhanced Network Manager combines rainwater forecasts and historic network performance with machine learning to predict future network behaviour.

Once a potential outage is identified the system runs thousands of scenarios in real-time to determine the optimum operational sequence to minimise or prevent outages. The system then enables the improved management of the infrastructure according to this sequence when similar circumstances are detected.

Using Enhanced Network Manager enables the utilisation of available storage within the sewer network to minimise network outages.

This means that the utilised storage volume within the network is greatly increased at a fraction of the cost, time and disturbance of installing additional storage via hard infrastructure (concrete tanks and pipes).

CASE STUDY.

WESSEX WATER

The Problem:

Wessex water provides water and sewerage services to 2.8 million people in the South West of England with 35,000km of sewers, clearing 13,000 blockages a year at a cost of £5m.

Wessex were looking for a technology company to assist them in identifying potential non-compliant out-of-sewer pollution events before they occurred. They wanted to use real-time alerts to identify potential non-compliant out-of-sewer events and proactively direct maintenance crews to remedy issues before they resulted in service failures (pollution or flooding incidents).

“One of the biggest problems we have serving our customers is not knowing where and when blockages will occur, or are likely to occur, in the wastewater network”

Jody Knight, Asset Technology Manager Wessex Water

The Solution:

Across the summer of 2020 StormHarvester provided near real-time level predictions and sewer blockage alerts to Wessex Water. These alerts were provided for the entire wastewater catchment of Bath, in South West England. The near real-time predictions and blockage alerts provided by StormHarvester were used to identify potential non-compliant out-of-sewer pollution events before they occurred and proactively direct maintenance crews to these locations to remedy issues before they resulted in service failures (pollution or flooding incidents).

StormHarvester's Intelligent Sewer Suite deployed a suite of customised machine learning algorithms on both CSO and pumping station sensor data and corresponding hyperlocal rainfall forecast data to predict network levels and detect potential blockage formations in real-time. Only existing sensors were used for this purpose and no new sensor installations were required.

“The Stormharvester system used machine learning to set safe operating windows for each asset. Each time these had a significant breach, we received alerts, which in turn were passed to the Operations team so that they could respond”

Edmund Willatts, Assets Reliability Engineer Wessex Water

Water Utility



CASE STUDY.

WESSEX WATER

The Results:

Wessex Water considered the alerts provided by StormHarvester a significant improvement on the previous situation where operational staff were regularly overwhelmed by the large number of high-level and overflow alarms occurring in the control room during periods of heavy rainfall.

The Wessex data revealed the following:

- A huge reduction in relevant control room alarms: If the StormHarvester solution had been implemented instead of the incumbent alarm system, a **96%+** reduction in control room alerts would have been achieved
- A high degree of blockage alert accuracy: **90%** of alerts StormHarvester provided were relevant and required
- Blockage formations were identified over 14 days before they resulted in service failures

“The Stormharvester team identified sewer blockages that using our normal working processes we may not have spotted until they had resulted in unwanted sewer overflow events”

Jody Knight, Asset Technology Manager Wessex Water

“During the trial, StormHarvester were able to identify sewer blockages very early on and we were therefore able to get the Operation teams to proactively intervene. This significantly increased our chances of making it quicker and easier to prevent spillages”

“This ‘condition based sewer maintenance’ vs. the scheduled cleaning regime will be key to making Operational teams more productive and efficient going forward”.

Edmund Willatts, Assets Reliability Engineer Wessex Water

Water Utility



Savings



96% reduction in control room alerts



90% accuracy in blockage & telemetry alerts

CASE STUDY.

NORTHUMBRIAN WATER

Northumbrian Water provides water and sewerage services to 2.7 million people in the North East of England with 27,000 km of sewers and cleared 9500 blockages in 2019. StormHarvester and Northumbrian Water have worked together since early 2018 to analyse pumping chambers in Newcastle-Upon-Tyne in Northern England. This discrete network was chosen due to the location of Combined Sewer Overflows, escapes (pollution and flooding), pumping stations within the catchment, and past rainfall events in the area.

Three years of data from 12 pumping chambers and Combined Sewer Overflows or escapes (pollution and flooding) were analysed using the StormHarvester Intelligent Sewer Suite. The analysis allowed Northumbrian Water to easily visualise their network performance and quickly identify, quantify and rank assets to see how they were performing or if they had particular sensitivities to rainfall.

The results of the analysis determined that on average a 30% reduction in Combined Sewer Overflows or escapes (pollution and flooding) spillages was achievable across the catchment using StormHarvester's real-time controls.

"The StormHarvester Intelligent Sewer Suite allowed us to easily visualise historic data from a section of our wastewater network. It allowed us to assess our network performance and quickly identify sites with particular sensitivities to rainfall. The StormHarvester team were easy to work with and have always been quick to respond and adopt to our particular requirements"

Linzie Pentleton, Asset Investment Programme Manager
Northumbrian Water

Water Utility



Savings



96% accuracy on
Combined Sewer
Overflows or escapes
(pollution and flooding)
spill prediction



30% reduction on
Combined Sewer
Overflows or escapes
(pollution and flooding)
spills



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