WESSEX WATER CASE STUDY USING AI FOR EARLY BLOCKAGE DETECTION AND CONDITION BASED MAINTENANCE



1. THE CHALLENGE

WESSEX WATER SERVES A LARGE AREA OF SOUTH WEST ENGLAND, COVERING 35,000KM OF SEWERS AND SERVICING 2.8MILLION CUSTOMERS.

DURING 2020, WESSEX WATER RAN A CHALLENGE THROUGH THEIR MARKETPLACE TO DEMONSTRATE THE VALUE OF APPLYING MACHINE-LEARNING (AI) TO:

- DETECT EARLY BLOCKAGE FORMATIONS IN THEIR WASTE WATER NETWORK BEFORE THEY BECOME SERVICE FAILURES (I.E. POLLUTION OR FLOODING INCIDENTS)
- ACHIEVE CONDITION BASED MAINTENANCE
- DIFFERENTIATE GENUINE CONTROL ROOM ALARMS FROM THOSE TRIGGERED SIMPLY BECAUSE OF HIGH VOLUMES OF RAINFALL

LEVEL MONITOR

OBJECTIVE 1 DETECTION OF EARLY BLOCKAGE FORMATION

BLOCKAGE FORMATIONS IN WASTE WATER NETWORKS NEED TO BE CLEARED QUICKLY TO AVOID POLLUTION, BUT THEY CAN BE HARD TO IDENTIFY BEFORE IT IS TOO LATE

PARTIAL BLOCKAGE

OBJECTIVE 2

CONDITION BASED MAINTENANCE USING MACHINE LEARNING TO TEST THE VIABILITY OF SHIFTING TO A MAINTENANCE STRATEGY THAT USES REAL TIME AND PREDICTED SEWER THRESHOLDS TO DRIVE OPERATIONAL PROCESSES

OBJECTIVE 3

CONTROL ROOM ALARM RATIONALISATION

WET WEATHER CONDITIONS CAN CREATE AN UNMANAGEABLE VOLUME OF ALARMS, MOST OF WHICH WILL SIMPLY BE TRIGGERED BY THE HIGH LEVEL OF RAINFALL RATHER THAN BLOCKAGES OR GENUINE ANOMALIES

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

2. THE 3 WEEK SET UP

WESSEX WATER SELECTED THE CITY OF BATH CATCHMENT, IN SOUTH WEST ENGLAND, FOR A 3 MONTH TRIAL ACROSS **98** ASSETS INCLUDING 7 PUMPING STATIONS. THIS CATCHMENT CONTAINED APPROX. 3,500KM OF PIPES REPRESENTING APPROX **10**% OF THEIR OVERALL PIPE NETWORK. 98 WASTEWATER NETWORK SENSORS WERE INVOLVED INCLUDING CSO MONITORS, EVENT DURATION MONITORS (EDM), SEWER LEVEL MONITORS (SLMS) AND 9 PUMPING STATION MONITORS.



PUMPING STATIONS

SEWER PIPES

BATH CATCHMENT MONITORS

BATH SEWER AND PUMPING STATION ASSETS MAPPED AGAINST A 1.5KM SQUARED OVERLAPPING GRID FROM HYPERLOCAL WEATHER FORECASTING SYSTEM HIGHLIGHTING HOW DIFFERENT ASSETS WILL BE SUBJECT TO VARYING MICROLEVEL RAINFALL ESTIMATIONS **ALLIONS BASED** ON SEWER LEVEL AND HISTORIC RAINFALL

DATA INPUTS

AI (MACHINE LEARNING) ALGORITHMS 'LEARN' ASSET BEHAVIOUR IN DRY & WET WEATHER DATA EXTRACTED AT AN ASSET LEVEL

3. THE SOLUTION

STORMHARVESTER APPLIED ITS INTELLIGENT SEWER SUITE PRODUCT AGAINST THE WESSEX WATER DATA. SIMPLIFIED, THE PROCESS HAS 5 STEPS:







PREDICTIVE SEWER LEVELS THRESHOLD FOR EACH ASSET CONTINUALLY ADJUSTED IN REAL-TIME



4. THE WESSEX WATER RESULTS

THE WESSEX WATER RESULTS PROVED THE VALUE OF AI TO ACCURATELY PREDICT BLOCKAGE AND ANOMALIES, ENABLE A SHIFT TOWARDS CONDITION BASED MAINTENANCE AND RATIONALISE CONTROL ROOM ALARMS.



DURING THE 3 MONTH TRIAL STORMHARVESTER IDENTIFIED AT LEAST 2 INCIDENTS THAT WE ARE FAIRLY CONFIDENT WOULD HAVE RESULTED IN CAT 3 SPILLAGES OR WORSE IF IT WAS NOT FOR THE EARLY BLOCKAGE DETECTION ALERTS RECEIVED AND THE SUBSEQUENT ACTION TAKEN BY OUR OPERATIONAL STAFF AS A RESULT.

JODY KNIGHT, ASSET TECHNOLOGY MANAGER - WESSEX WATER

5. CONCLUSION

BASED ON THE VALUE BROUGHT BY THE STORMHARVESTER ALERTS, WESSEX WATER DECIDED TO KEEP THE ALERTING SYSTEM RUNNING ON THE BATH CATCHMENT AFTER THE INITIAL PROOF OF CONCEPT.

DURING THE TRIAL, STORMHARVESTER WAS 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 PREVENTING SPILLAGES.

EDMUND WILLATTS, ASSET RELIABILITY ENGINEER, WESSEX WATER

JOIN THE SMART SEWER REVOLUTION