





cloud-based
systems for
measurement
and verification



REMOTE DATA IN REAL TIME

- unlock hidden facts
- build predictive responses



cloud-based
robotic water
quality
measurement



REMOTE WATER QUALITY ANALYSIS

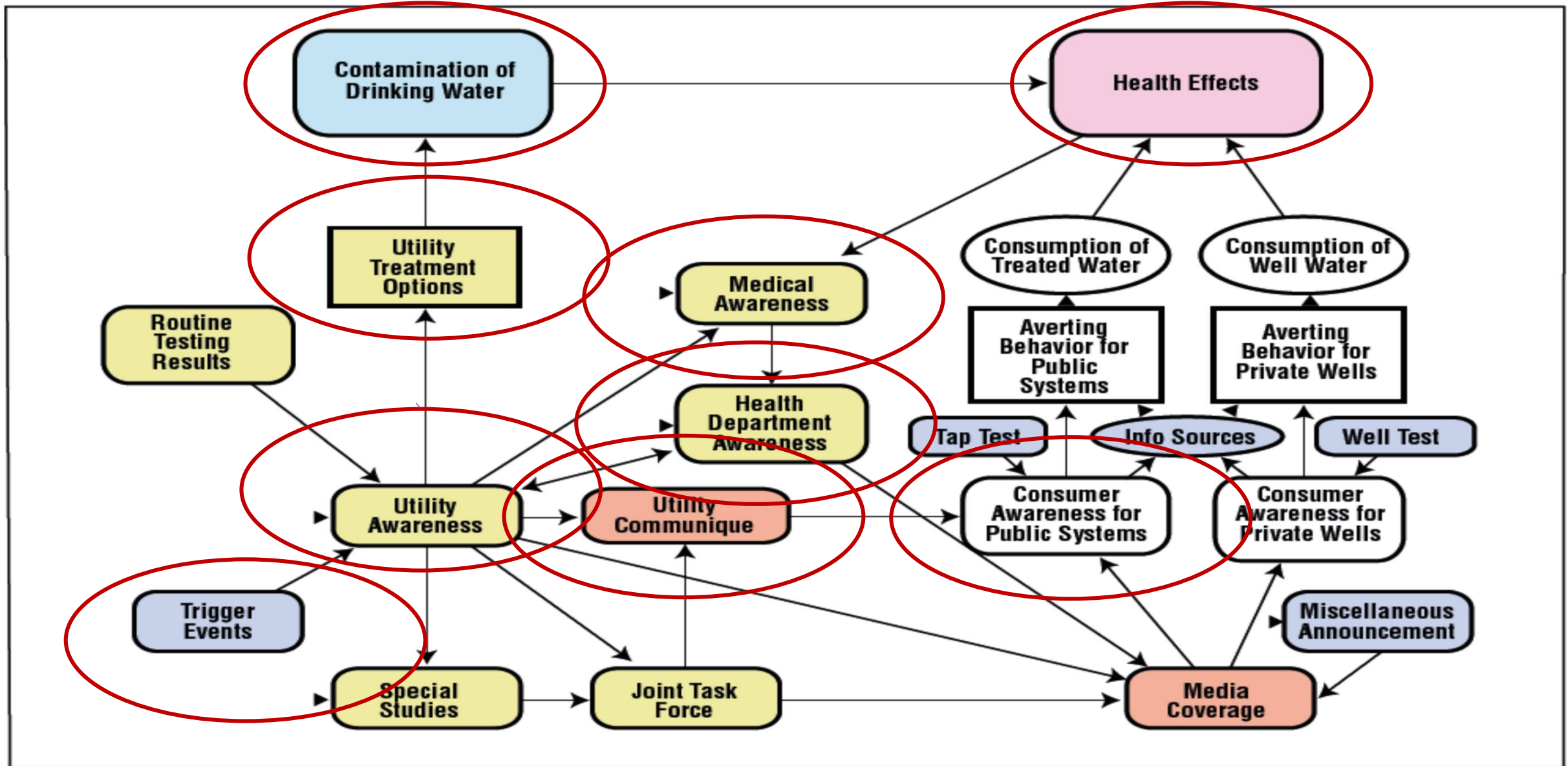
- Up to 5,000 interactive water quality measurements every day from every robot
- always operating 24 x 7 x 365

Figure 1. Model predicting the effects of measures to reduce health effects of contaminants in domestic water supplies

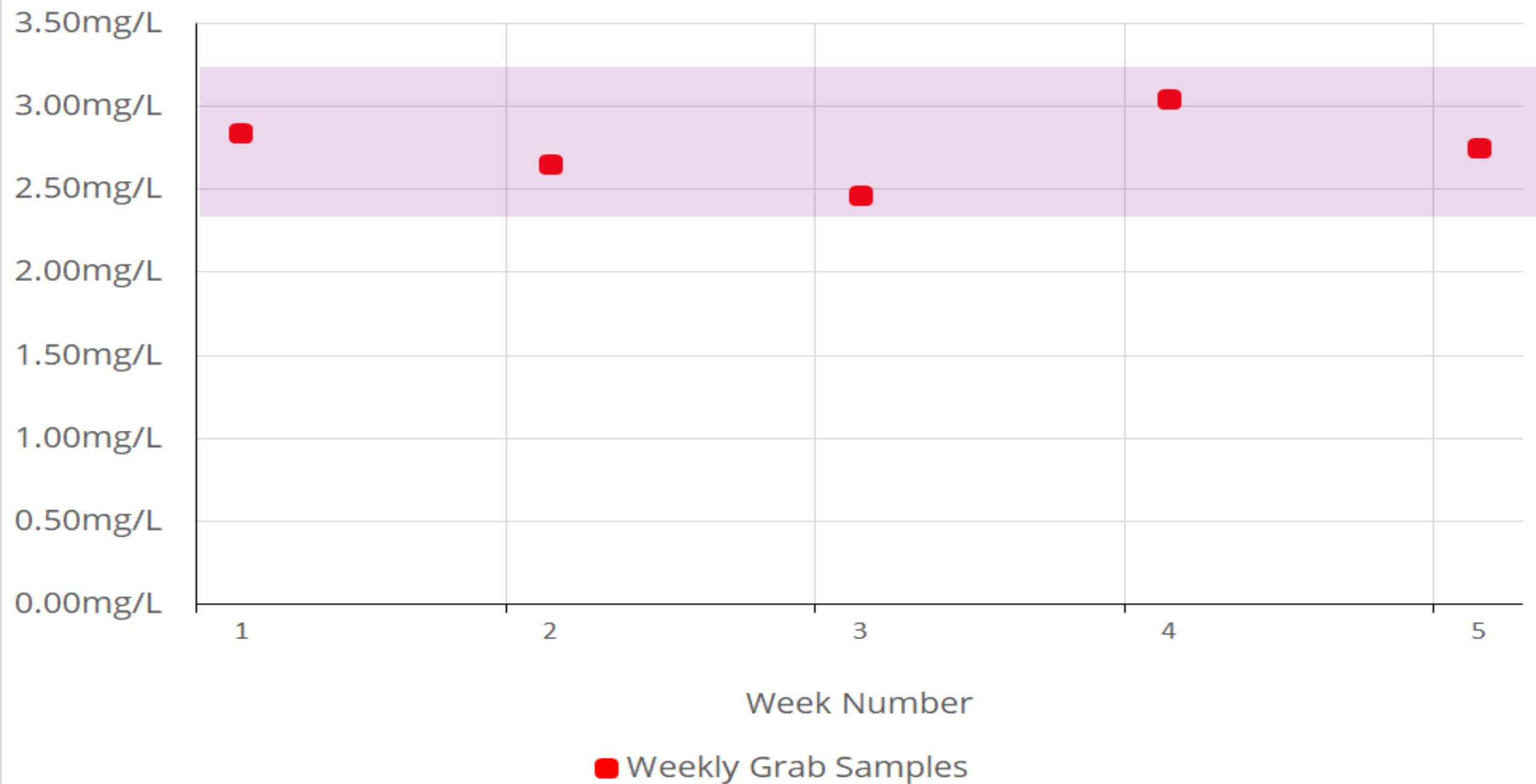


Trigger
Events

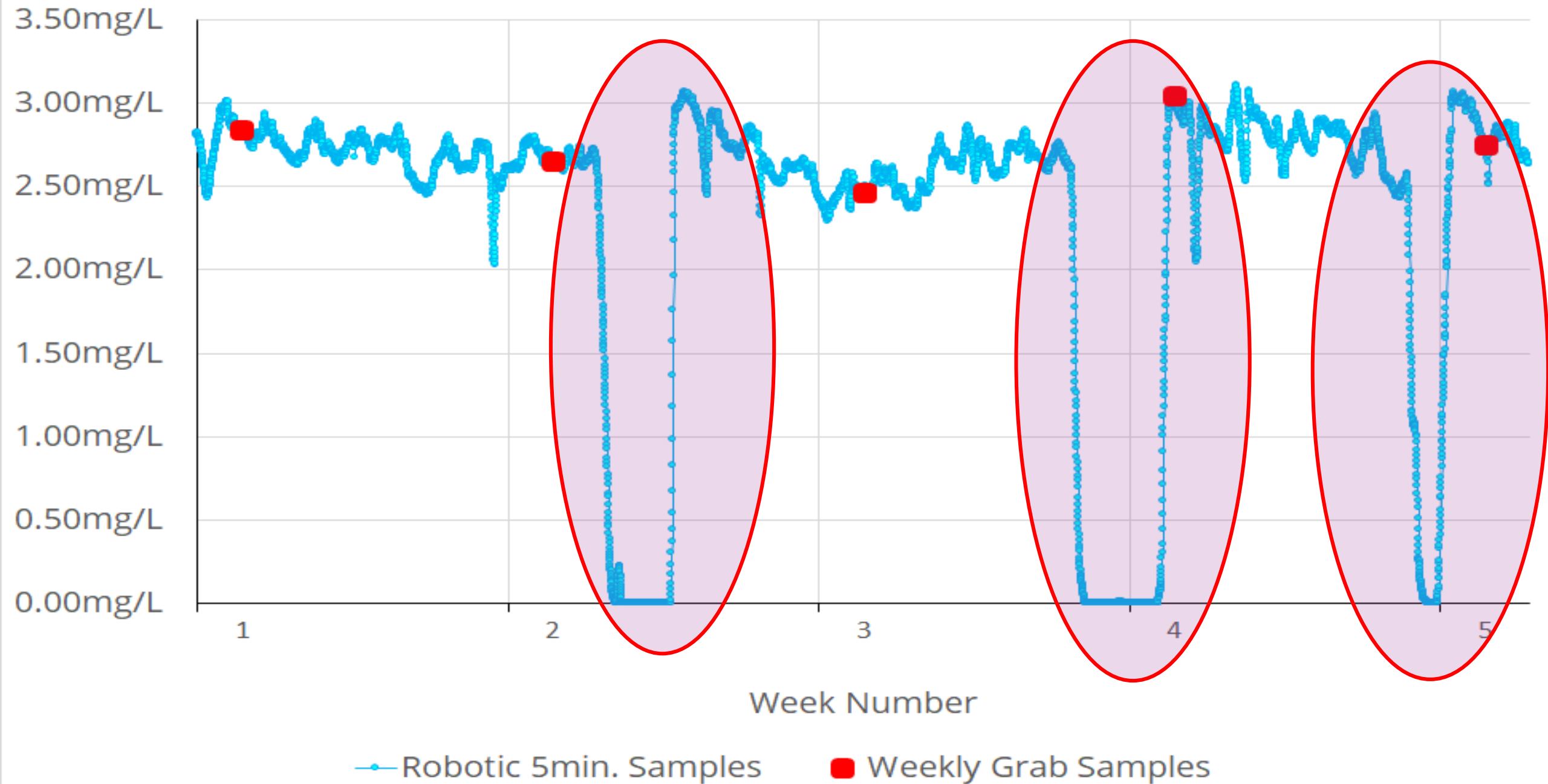
Figure 1. Model predicting the effects of measures to reduce health effects of contaminants in domestic water supplies



Free Chlorine: 1 Month 5min. Robotic Samples vs 1 Week Grab Samples



Free Chlorine: 1 Month 5min. Robotic Samples vs 1 Week Grab Samples



4 Key Areas For Cloud M&V

hospital or health facility

utility water supply

real-time measurement of incoming water quality

water storage & delivery

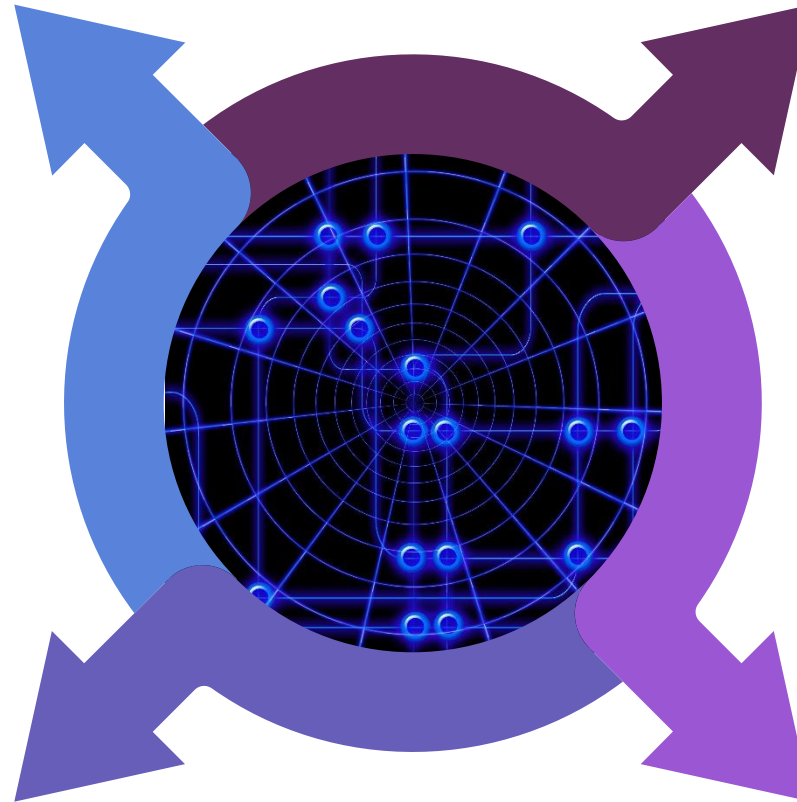
cloud-based monitoring of internal water distribution.

cooling towers & AHU's

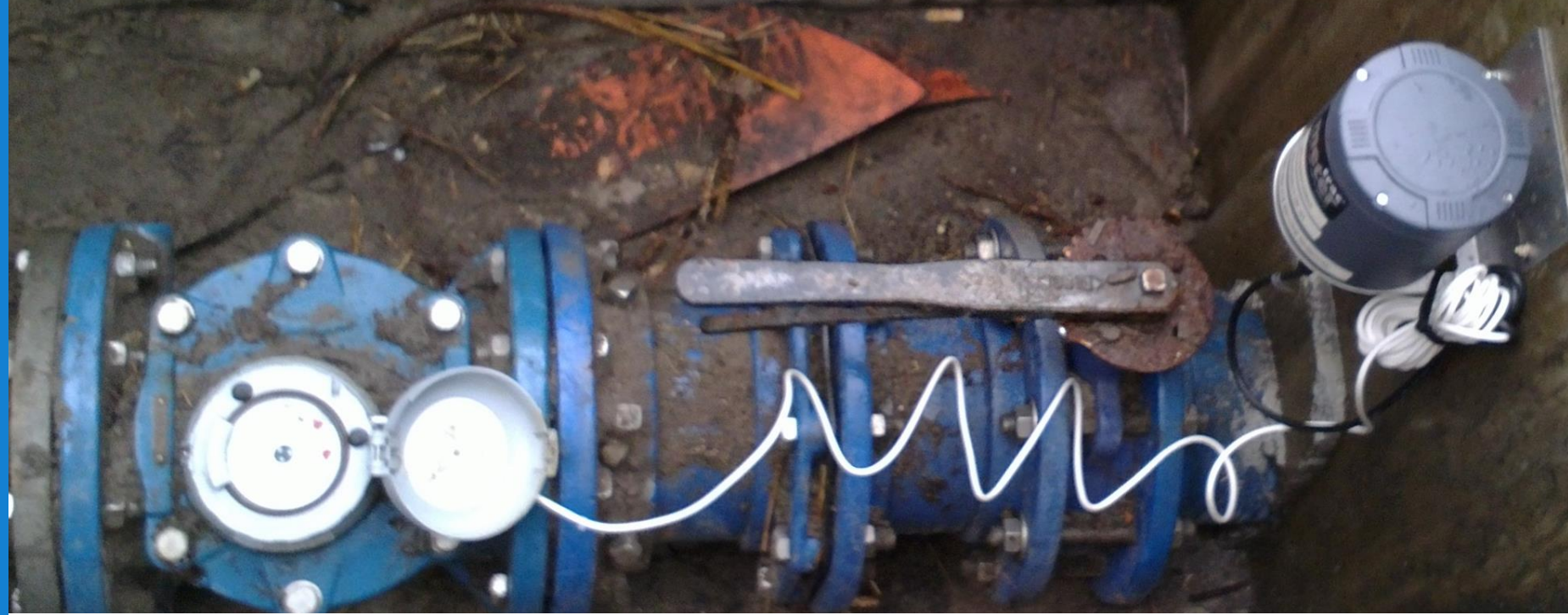
measurement of bleed water, makeup water etc

water temperatures

real-time measurement of hot, chilled and cold water temperatures



real-time physical
and chemical
measurements of
incoming water
quality



MONITORING WATER QUALITY ON MAINS WATER SUPPLY

- identify supply problems immediately
- data for evidence of fault
- data for evidence of rectification

physical and
chemical water
quality indicators
measured in real-
time

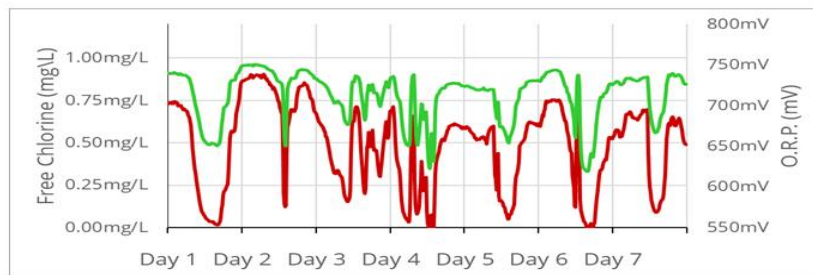
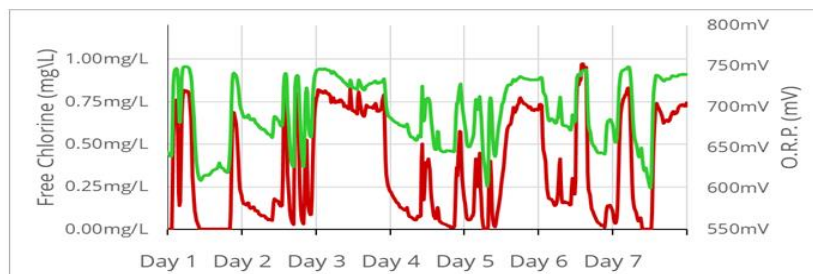
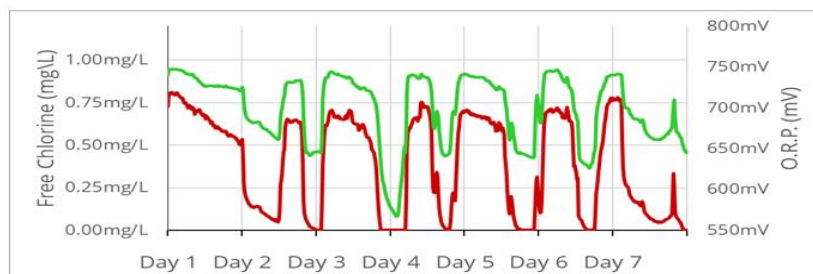
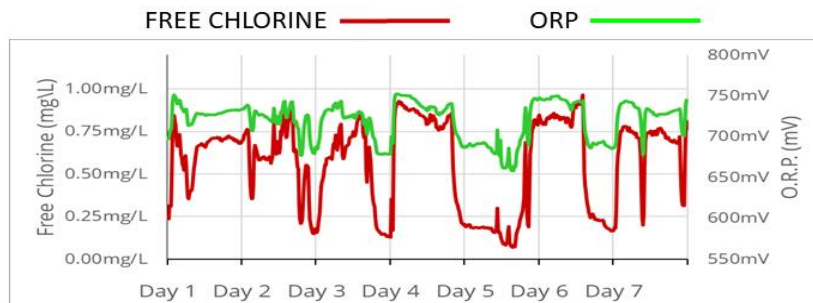


Comparison ORP to FAC

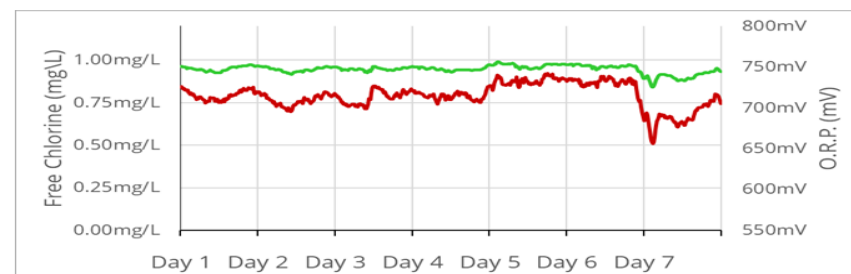
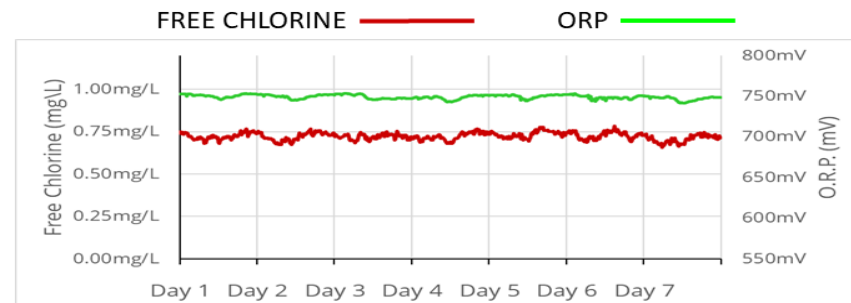
over 16,000
measurements
taken at 5 minute
intervals



SITE 1, 4 Consecutive Weeks
Free Chlorine VS ORP, 15 minute samples
16,128 robotic samples



SITE 2, 4 Consecutive Weeks
Free Chlorine VS ORP, 15 minute samples
16,128 robotic samples



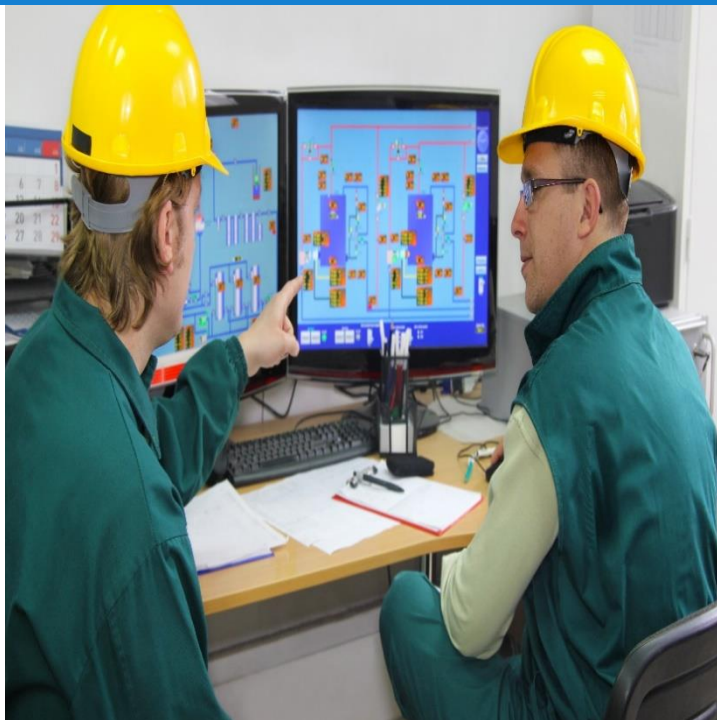
interactive cloud-based monitoring of multiple cooling towers and AHU's



MONITORING COOLING TOWER OPERATION

- real-time alarms & alerts
- remotely managed sites
- can be data-linked into existing SCADA & BMS systems

cloud-based
monitoring of
temperature
measurement
points



REMOTE WATER TEMPERATURE MEASUREMENT

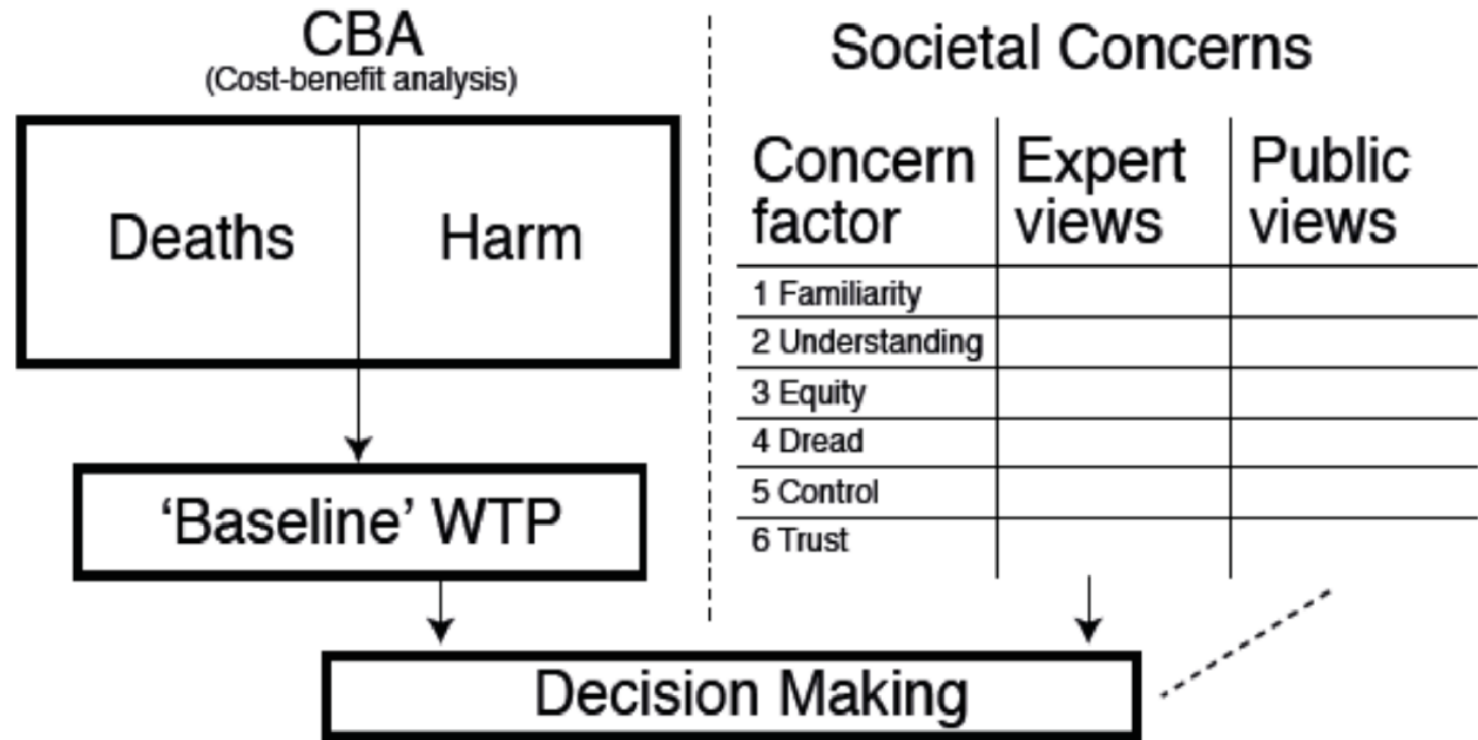
- every 60 seconds
- -55C to +125C
- auto alarms

interactive cloud-
based monitoring

....what's the
cost/benefit?



Concern Assessment Framework



Cost-benefit analysis (CBA) can be used to estimate the economic value attributes on the left (death, harm), producing the amount that one should be willing to pay (WTP) to avoid them. The ones on the right are judged on five levels of each attribute. As an example, for dread, these levels are: (1) trivial, temporary, and commonplace; (2) potentially serious, but treatable; (3) serious, long-term but natural; (4) serious, permanent and unethical; or (5) catastrophic, permanent and highly feared.

cloud-based
measurement &
verification...
...unlock the
data



**the industrial internet
of things has arrived**

