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Let's Solve Water

Case study
Stormwater Monitoring
OWQ

Optimising Water Quality Monitoring and Autosampler Operations in underground stormwater systems

Perth, Western Australia

In 2017, the Australian Federal Government's Smart Cities initiative provided funding to a council in West Australia for the implementation of a Wetlands Smart Sensor Monitoring Program. The primary objective of this program was to deploy advanced environmental sensors to safeguard a delicate wetland system.

The Smart Cities Plan (Commonwealth of Australia 2016) outlines key objectives including the drive to take up smart technology to improve the sustainability of cities and dirve innovation. An example presented in the document is the use of data and analytics to inform city planning and infrastructure investment with greater potential to improve decision making.

"We will drive the take up of smart technology, to improve the sustainability of our cities and drive innovation."

Furthermore, under the National Innovation and Science Agenda, the Australian Government is releasing more non-sensitive public data for private sector innovation, and is using this data to improve service delivery and to inform policy (Commonwealth of Australia 2016).

Project

Given this objective, the project included design and installation of stations to monitor stormwater flowing through a gross pollutant trap (GPT See Figure 01)) which treated surface water runoff flowing into the wetlands.

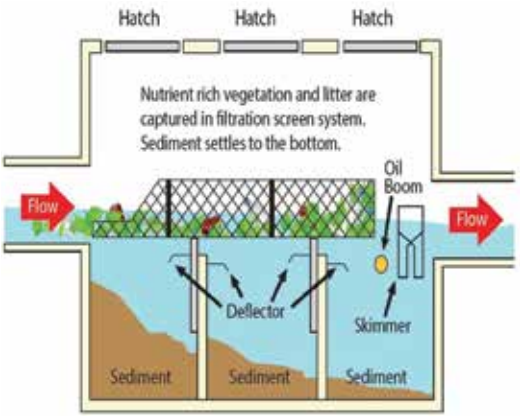

Figure 1 Gross Pollutant Trap General Schematic
**Image courtesy Atlan https://atlan.com.au/bafflebox/*

Figure 2 Monitoring Station Construction

YSI
a xylem brand

Xylem Australia was tasked to create a smart water monitoring system to investigate:

1. Water quality and load flowing into the wetland
2. Industrial catchment stormwater characterization
3. Gross pollutant trap effectiveness

Within the design framework, criteria was set to leverage on providing environmental data in near real time to a central portal such that management of the station itself could be optimized as well as enabling users of the information ready access to the data.

Challenge

Xylem had three major project challenges for this monitoring assignment:

1. System design had to collect underground water runoff samples and process them in above-ground units to enable operation and maintenance without confined space entry
2. System design needed to control an autosampler remotely - re-setting sampler count, disabling it when full, managing battery and power for maintenance, and timing sampler activation to collect samples during periods of sufficient flow
3. The station was required to present data from the stations in an easy-to-access online portal for all stake holders to access

In addition, asset configuration and hydraulic characteristics were not uniform in the upstream and downstream access chambers of the GPT necessitating a bespoke measurement system design to ensure accurate measurement of the stormwater.

Solution

Xylem designed and installed an effective remote pollutant monitoring system using two integrated water quality and discharge stations monitoring the inlet and outlet of the Gross Pollutant Trap. Using intake and return hoses running into the manholes as well as instrumentation cables in conduits, Xylem was able to physically centralize all instrumentation into easy access enclosures at the surface.

Figure 3 Instrument Enclosures and Rain Gauge

Figure 4 Upstream Manhole

Figure 5 Downstream Manhole

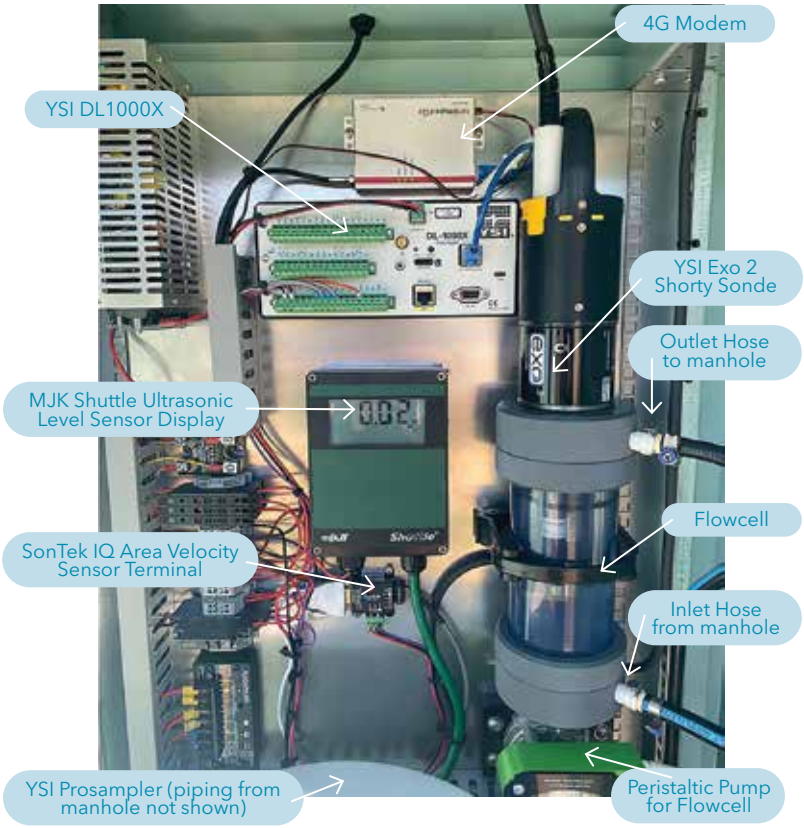

Figure 6 Instrument Enclosure and Sensor Layout

By housing the YSI water quality sonde in the enclosure rather than inside the access chamber, routine maintenance operations as well as calibrations could be conducted safely without any confined spaces entry. This was extremely effective in reducing the operational burden.

Upstream Manhole	
Xylem SonTek IQ Area Velocity Sensor	Pipe Flow
Xylem YSI Exo 2 Sonde	pH, DO, Turbidity, EC, Temperature
Xylem MJK Ultrasonic Level Sensor	Manhole Surcharge Depth
Xylem YSI Prosampler	24 Bottle Autosampler
Xylem YSI DL1000X	Data Logger
Xylem Global Water Instruments RG600 TBRG	Rainfall
Downstream Manhole	
Xylem MJK Submersible Pressure Sensor	Pipe Flow (from rated V Notch Weir)
Xylem YSI Exo 2 Sonde	pH, DO, Turbidity, EC, Temperature
Xylem YSI Prosampler	24 Bottle Autosampler
Xylem YSI DL1000X	Data Logger

Table 1 Xylem Station Instrumentation Inventory

Figure 7 SonTek IQ Pipe Flow Meter

Figure 8 Stormwater Event Operation

Screenshot of Eagle.io Online Portal Customisable Dashboard - Autosampler Remote Operations

Autosampler was able to be disabled through the online portal so it would not be activated

Autosampler was able to be triggered based on water levels and time. Trigger values can be changed on the online portal which would update the logger automatically which controls the Autosampler

Autosampler bottle count can be reset through the online portal once new bottles are replaced

Figure 9 Online Dashboard optimizing Station Operation and Maintenance

Data for both stations was then centralized into the Eagle.io platform where system performance could be easily monitored online. Automated SMS and email alarm protocols were setup to alert operators to rainfall and sampler activation such that sample collection works could be prioritized.

Results

The Xylem team was able to set up an effective remote sampling monitoring system for a hard-to-reach water source and deliver on the Smart Cities project objectives.

More importantly the ongoing operation of the station was optimised for efficiency.

This included:

- Easy access to instrumentation for calibration and maintenance
- Easy to view online dashboard to determine station performance and access time series data
- Setup of customised SMS and Email alarms and alerts to improve efficiency of water sample collection process
- Online configuration of sampler trigger levels, resetting autosampler bottle counts and enabling and disabling samplers meant there was a centralized portal to run the monitoring campaign.

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