TECHNICAL DOCUMENTS

fluid robotics

WASTEWATER SURVEILLANCE & PUBLIC HEALTH

fluid|health

Automated Sampling

- Time and Flow based Grab and Composite Sampling
- Programmable flow-rates 0.1 ml/min - 1,000 ml/min
- Fluid**Health** App for safe, touch-free and remote operation
- Samples stored at 4°C
- Portable and easy to install in manhole chambers, STPs, Water Tanks, etc.
- Battery Operated and easy to sanitize
- Customized sample storage capacity
- Customized sample containers based on sample type

Remote Level Monitoring

- Real-time water level monitoring system for installation inside sewer manhole chambers and STP outlets
- Remote monitoring capability
- Auto-clean option available
- **Dashboards** for real-time tracking, alerts and preventive action
- Customized early-warning system for pipeline blockages and flooding
- Prevent Sanitary Sewer Overflows (SSOs)
- Optional integration with Fluid**Health** Sampler

info@fluidrobotics.com | +91 7720035843

Wastewater Quality and Pathogen Detection

- Real-time BOD, COD, TSS, pH monitoring system for installation inside sewer manhole chambers, STPs, tanks, etc.
- Automated sampling and lab testing for **effluent quality** parameters such as pH, TSS, BOD, COD, Total Nitrogen, Total Phosphorus, Fecal Coliform, etc.
- Optional laboratory testing of certain heavy metals, oil and grease, pathogens, TDS, etc.
- **Dashboards** for real-time tracking, alerts and data transfer to government portals
- System integration optional
- Customized **pathogen detection programs** including SARS-CoV-2 RNA in wastewater for cities, communities, commercial establishments, etc.

fluid|health

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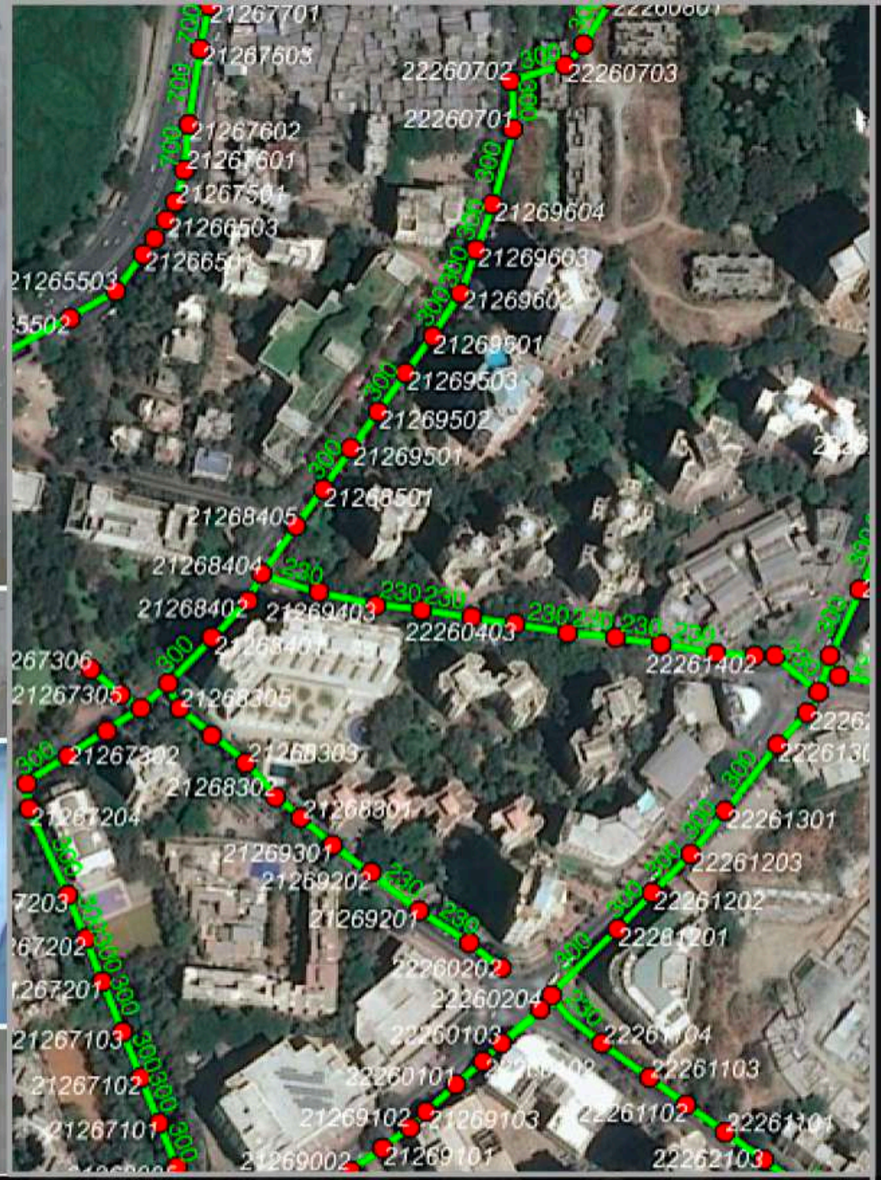

fluid|ai

AI Based Pipeline Fault Detection and Pipeline Mapping

- Artificial Intelligence based **Software-as-a-Service** product for automated fault detection from pipeline CCTV video
- Compatible with international **sewer inspection standards** such as PACP and WRC
- **Cloud-based** data management for secure access
- Optional defect data integration with **GIS**
- Optional **Asset Management** for sewer and water pipelines
- Pipeline digitization for **smart cities**
- Increase daily inspection productivity by more than **2x**
- Reduce inspection costs by **50%**

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SENTRY™

Real-time microbial performance monitoring in wastewater treatment systems.

Monitor microbial bio-activity, optimize performance and provide early warning of system imbalance.

Reduced risk of process failure by preventing toxic events and system imbalance.

Detailed monitoring to identify patterns in system performance (daily, weekly, monthly)

Increased efficiency by mazimising reactor performance.

Clearly monitor real-time performance of resident microbiology from any device.

Receive early warning alarms for system imbalance and toxic events.

Accurately diagnose poorly performing systems and match to operational events.

Version: SENTRY-2.0

IWT IslandWater TECHNOLOGIES

SENTRY™

Probe Installation

The SENTRY probes are designed to installed in various anaerobic and aerobic locations through the wastewater treatment process. including:

- Influent load/fluctuation monitoring
- Toxic shock monitoring and identification
- Conditioning tank optimization for biological phosphorous removal
- Nutrient bioreactor monitoring
- Monitoring of anaerobic digestion performance
- Effluent compliance monitoring

SENTRY probes can be installed easily with existing recirculation lines of a tank.

The probes install into a PVC in-line tee fitting with an 1.5" NPT thread. A suitable tee fitting will be suppied to fit each on-site application.

Recommended tee size : Sch 40/80 PVC 2" or larger

SENTRY probes can also be easily added to numerous open bio-reactor locations using drop-in installation options.

Figure 2.3
Protected drop-in mount

Figure 2.0
installed in 2" tee

Figure 2.1
Electrodes installed parallel to flow path.

Figure 2.2
Open bio-reactor install

Figure 2.4
Drop-in mount option

IWT IslandWater TECHNOLOGIES

SENTRY™

Technology Description

SENTRY is a world-first, real-time sensor solution that provides direct monitoring of microbial activity of the microbes involved in the wastewater treatment process.

SENTRY leverages bio-electrochemical sensor technology to relay bio-activity (metabolic activity) of the microbiology to the wastewater system operator. This data allows operators to continually monitor the microbial stability (health) of their wastewater treatment process. Furthermore, this data can be leveraged with other water quality and operational data to improve/optimize system performance.

Bio-electrochemical systems (BES) are a novel technology that rely on bacteria that use insoluble metal deposits as electron sinks during the anaerobic consumption of organic substrates. By substituting an electrode for the metal deposits, electrical current can be recorded as it passes through an external resistor. The generated bioelectric current is the product of microbial metabolic activity of exoelectrogenic bacteria involved in the wastewater treatment process. The obtained biological data is instrumental in understanding the impact of water quality (pH, nutrient content) and operational parameters (temperature, flow rate, organic load) on the biological process's efficiency, and resulting system performance.

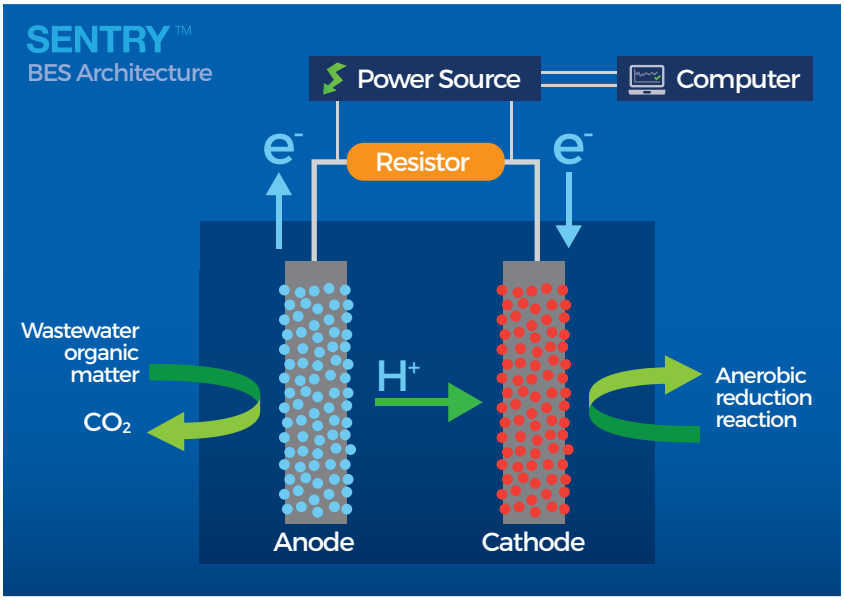


Figure 1.0 - BES Architecture Diagram

SENTRY includes an online dashboard for remote visualization and storage of real-time microbial performance data. SENTRY is a tool for system operators to help stabilize/optimize system performance and avoid costly system failures by providing early warning of biological instability.

The sensors are installed and connected through a 1.5" NPT fitting into a pipe with at least 2" in diameter. Typical installation for a single probe is in the recirculation line of the anaerobic tank, but if sequential tanks are present - for hydrolysis, acidogenesis etc. – a probe installation in each tank is recommended.

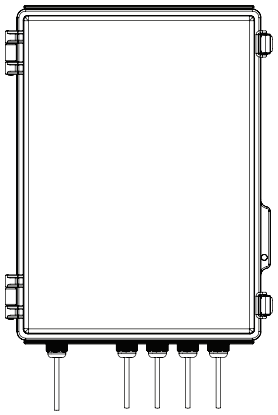
NOTE: Each SENTRY system can accommodate up to 4 probes.

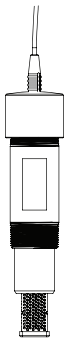
Data produced from the sensor can be used to:

1. Predict process upset via instability in microbial metabolism
2. Correlate fluctuating bio-electrode output to system input / process / operational events
3. Aggregate data to determine daily, weekly, and monthly performance patterns

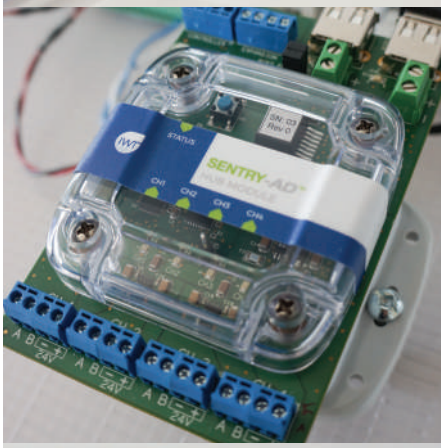
SENTRY™

General Specifications



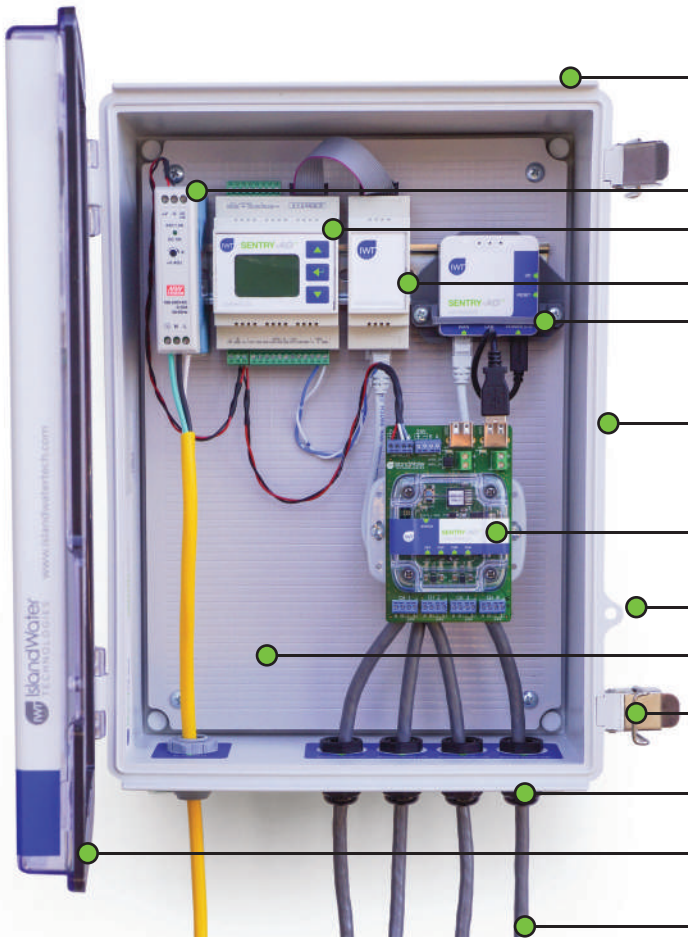


Dimensions	15.9” x 12” x 5.2”
Enclosure	NEMA 4X/IP67 wall mounted
Inputs	IWT SENTRY probes (up to 4)
Probe	In-line 1.5” NPT via IWT 2“ Sch 80 Tee fitting.
Certification	UL/CSA 61010 certified
Power Supply	100-240 VAC 50/60Hz, 24vDC operating.
Communications	WiFi. Optional cell modem
Interface	Onboard operational status indicators. Touch panel on controller with display for current reading and operational status
Data Management	Cloud storage provided – Online real-time dashboard with graphs provided – Data available for download for further analysis

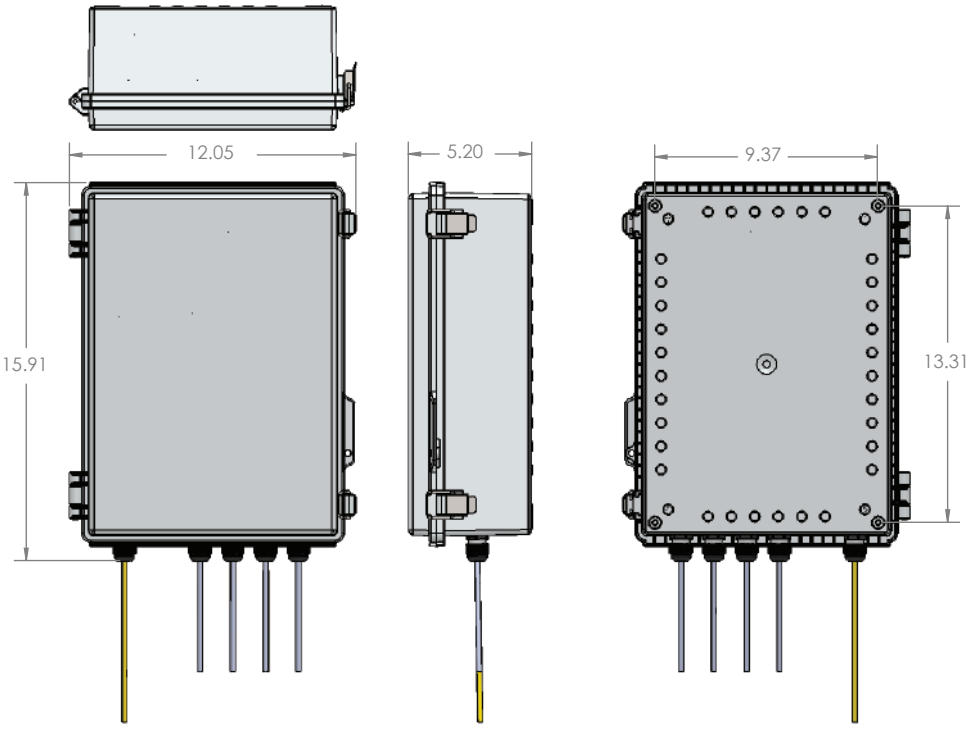


SENTRY™

Housing Features



- Wall Mountable
- Power Supply - 110-220v power in
- Main Control Unit - Processes data for transmission
- Ethernet Module
- Wifi Module - Connects to local Wifi
- Nema 4x Housing Box
- Hub Board - processes probe data (up to 4 Probes)
- Lockable housing
- Cell Module (Not shown)
- Secure door latches
- Cable gland seals
- Hinged door access
- Direct wired probe inputs



Housing Dimensions

Overall sizes, not including mounting brackets.

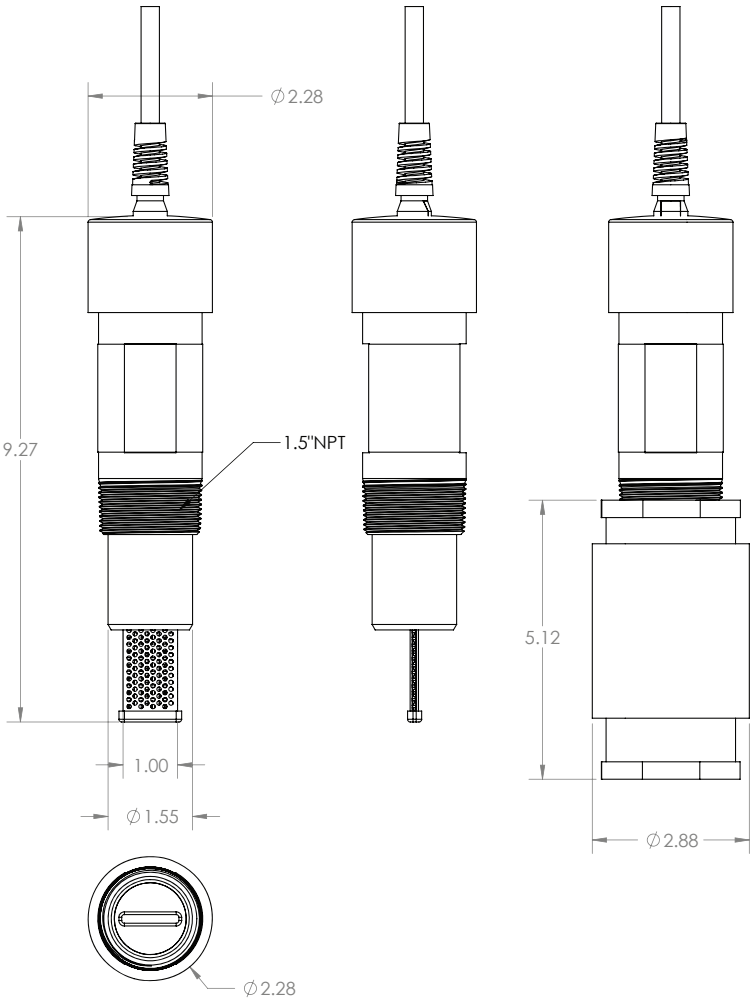
Dimensions in inches

IWT IslandWater TECHNOLOGIES

SENTRY™

Probe Features

Bio-Electric Sensor Probe 1.0



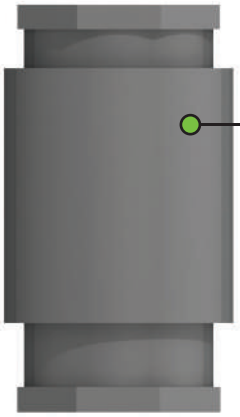
15' data cable

Strain relief

Sealed electronic housing

1.5" NPT fitting
(to fit bushing adapter)

Electrodes



Inoculation housing

Dimensions	As above (Dims in INCHES)
Cable	Standard 50', other lengths available
Install	Standard 1.5" NPT PVC fitting, other options available

IWT IslandWater TECHNOLOGIES

SENTRY™

Online Dashboard

The online dashboard allows users access to visualize microbial-electrode metabolic activity in real time. Data is presented with user options to view on hourly, daily, weekly, monthly or customized intervals. Customizable alerts can be setup for real-time operator notifications.

Data can be selected and downloaded in CSV format for off-line data analysis. Multiple installed electrodes can be visualized with the same login and dashboard allowing for a single location to visualize a network of installed probes or systems.

Microbial Performance Monitoring

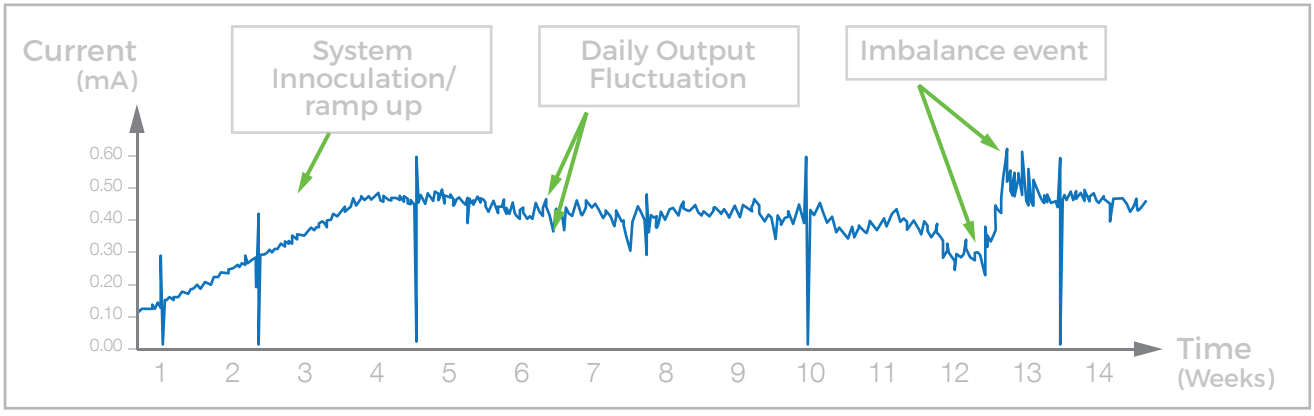


Figure 3.0 - Sensor data, as displayed on the dashboard, from a sensor installed as a commercial demonstration

IWT IslandWater TECHNOLOGIES

Integrated Intelligent Bio-Sensor (I2BioS)

I2BioS

On-line and Real time Water Toxicity and Quality Monitoring Sensor System

Real time 24/7 detection of heavy metals and cyanide along with pH and ORP

- State-of-the art patented MES (Microbial Electrochemical Sensor) technology
- Stand-alone fully automatic sensor system
- Economical alternative of pH based penstock system
- Artificial Intelligence (AI) enabled
- Real-time and online surveillance
- Provides end-to-end solution
- Low maintenance

Integrated Intelligent Bio-Sensor (I2BioS)

Intelligent Sensor System based on state-of-the-art MES Technology for Real-Time Water Toxicity and Quality Monitoring

EnvironSens

Integrated Intelligent Bio-Sensor (I2BioS)

Smart Sensor System for On-Line Water Toxicity and Quality Monitoring

Features

- Fully automatic stand-alone sensor system for online measurement of water toxicity and quality monitoring
- 24/7 online biomonitoring system for detecting the presence of heavy metals, cyanide and acidic toxicity
- In-house autosampler for collecting and storing toxic sample
- Real-time data analysis, on-line surveillance and remote operation through AI enabled IoT platform

Benefits

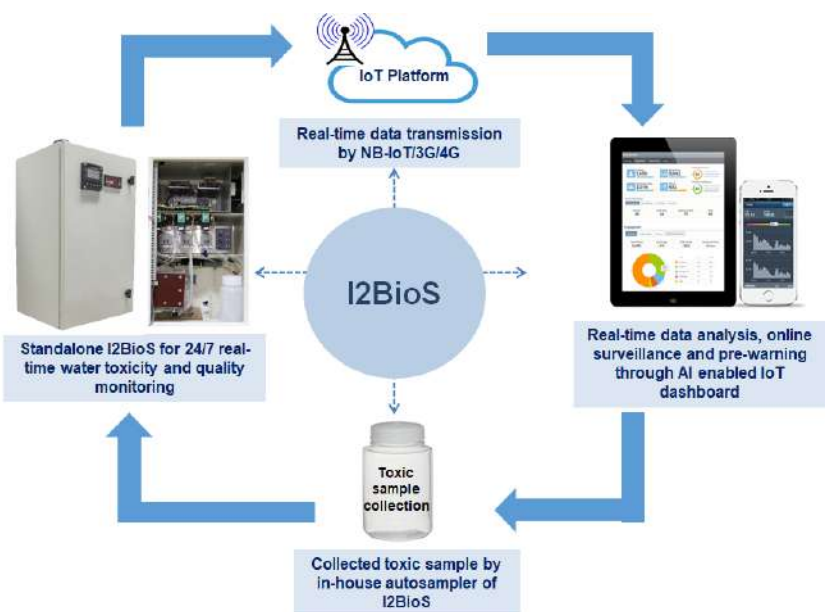
- Prevents accidental or illegal discharge of heavy metals into sewer network and water bodies
- Provide timely detection to prevent high concentrations of heavy metals in trade effluents/wastewater from entering wastewater treatment plants (WWTPs)
- Provides inexpensive replacement of current penstock systems
- Assures reliable 24/7 operation, provides grabbed toxic sample as a proof of discharge limit violation, alerts authority for immediate action and saves manpower time
- Fully enclosed and safe for on-site operation

Applications

- I2BioS can be deployed at the last discharge point of any factory/industry, sewage network, water resources (river, reservoirs and lakes, etc.), pumping stations, Wastewater treatment plants, etc.
- Holistic solution for measuring real-time heavy metal toxicity together with pH and ORP.
- Can be integrated with a central information system and also be customized to measuring other water quality parameters such as COD, BOD, TSS, EC, TOC, DO, nitrate, ammonia, etc.

Product Specifications

Output Signal	Voltage or current
Heavy Metal Detection Range	1ppm-500 ppm
Heavy Metals Detected	Cu, Zn, Ni, Cd, Cr, Pb, Hg, As, Ag, CN, etc.
Sensor's Response Time	< 20 mins
Data Update Frequency	1 min
Sample Temperature Range	4-60 C
pH Detection Range	1-14
Power Consumption	< 350 W
Dimensions HWD enclosures:	1000 x 500 X 500 mm
Weight	~ 55 Kg
Operator Interface	AI enabled IoT platform and dashboard
Sampling Facility of in-house Auto-sampler	8 Samples
Required Maintenance Frequency	15 Days



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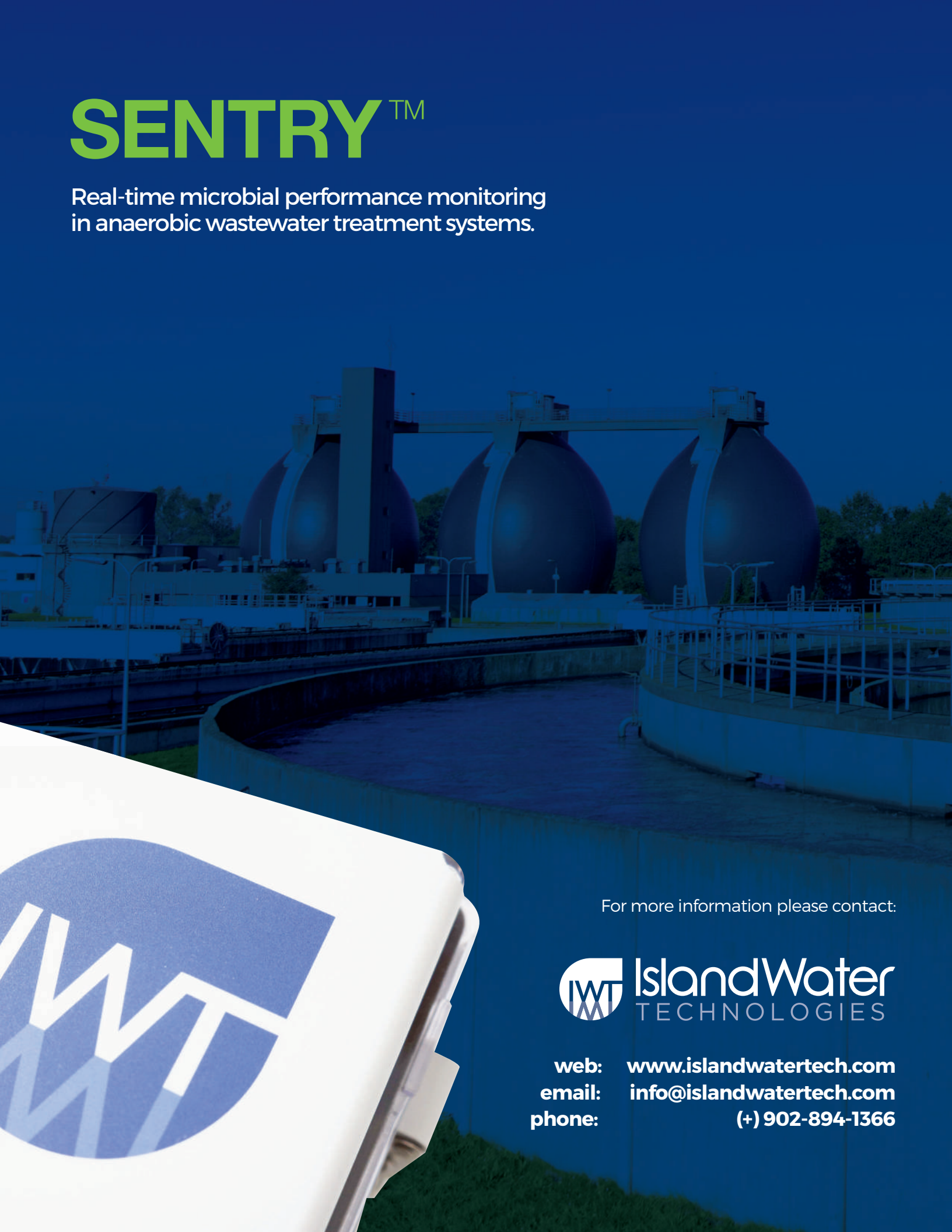
W: www.environsens.com | **E:** Shailesh@environsens.com

SENTRY™

Real-time microbial performance monitoring
in anaerobic wastewater treatment systems.



For more information please contact:

Island Water TECHNOLOGIES

web: www.islandwatertech.com
email: info@islandwatertech.com
phone: (+) 902-894-1366

SpaceAge LABS

Revolutionizing Operations and Maintenance of **remote & distributed assets in water / wastewater networks**

Company Deck

Aug 2021

Urgent need of digitalization in urban water & landscaping:

- Lots of Distributed Assets, insufficient real-time data
- Increasing Demand, stress on current systems
- Silo-ed Solutions, need for Unified Data Platform

Image (on the right): Sewer networks in cities are under tremendous stress and can lead to sewage overflowing into streets. Real time sewer data and prediction of such overflows could be a gamechanger.

Solution

Enterprise Grade, Real-time Data Collection to Insight Platform

Desired Business Outcome
(reduce downtime, improve safety, ensure quality)

Data Insights, Visualization & APIs

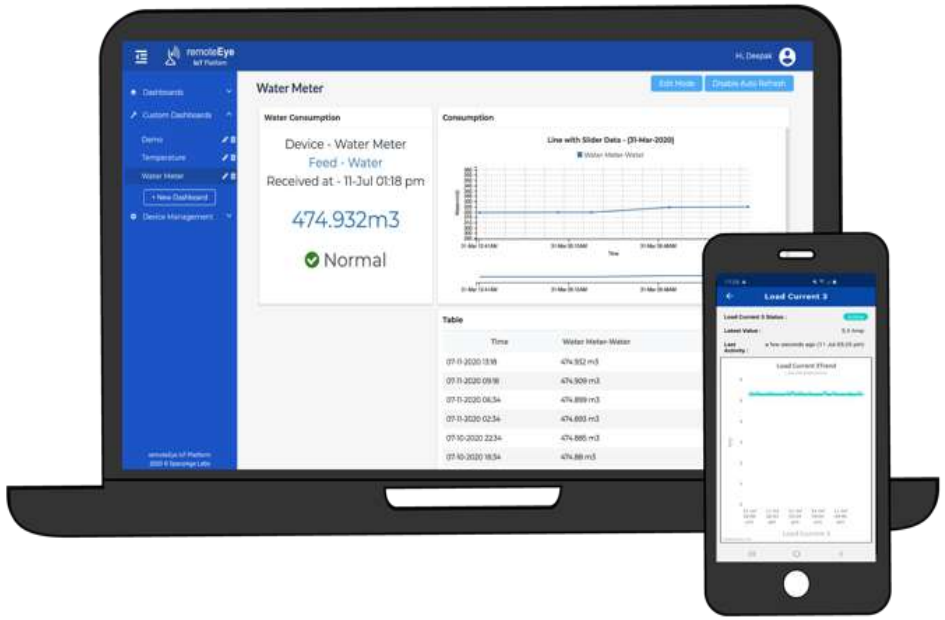
Data Analysis & **Machine Learning**

Device & Data Management

Low Power/Cost Wireless Data Transmission

Remote Industrial Data Collection

All your Remote or Distributed Assets
(water meters, sewers, pipes, pumps, skids, mobile equipment)



rEye
Data-to-Insight Platform

- **Unified Asset Data Platform** : Single Source of Truth
- **Cloud-Based SaaS :** Secure, Scalable, Convenient
- **No-Code Interface** : Easy to Deploy, Use & Maintain

Products & Solutions

Powered by rEye Data-to-Insight Platform

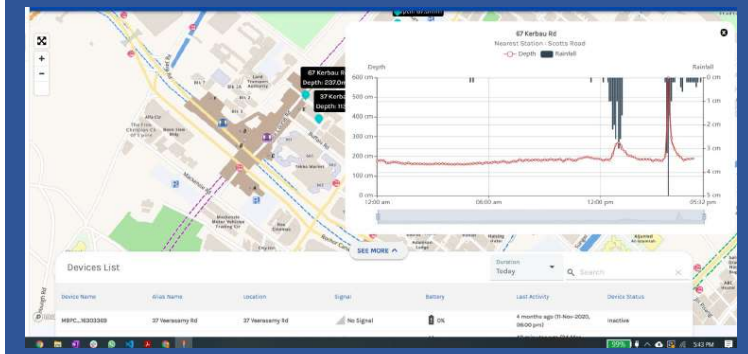
remoteEye

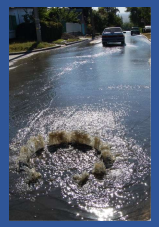
Full stack solution to connect any asset to IoT over low power wireless networks

Monitoring & Control of remote M&E assets

SewerEye

Low Power IoT Devices + AI/ML Software for holistic predictive maintenance of wastewater networks

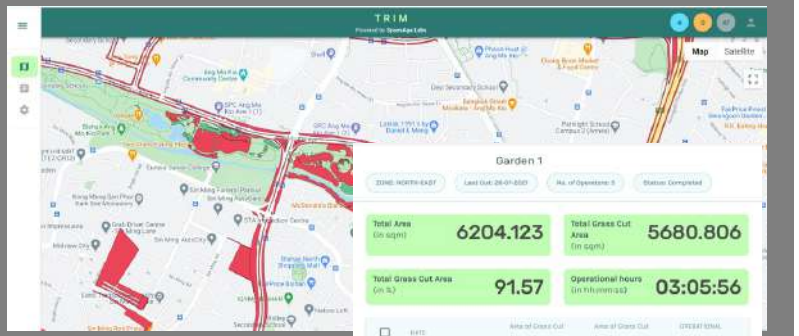




Sewers, Drains, Grease Traps, Tankers, Pumps

Landscape IoT *

(High Precision GNSS Trackers & Geospatial Analytics Software to monitor & quantify outdoor work)



Grass Cutting, Road Sweeping, Snow Removal etc

* Working Title. Currently under process of being given a brand name.

How it works

Flow

Level

PLC

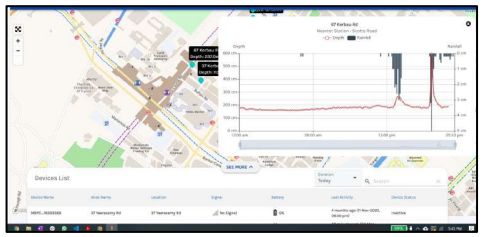
Quality

- Sewers / Drains / Pipes
- Decentralized Skids
- Tankers
- Remote Pumps
- Rivers, Lakes, Reservoirs

Insights / Visualization

- **Web / Mobile / GIS**
- SMS, WhatsApp, Email Alerts
- No-code, Customizable Dashboards

remoteEye
Basic Data Visualization & Management Tool



SewerEye
Advanced Tool for Wastewater Network Predictive Maintenance

Data Collection / Transmission

- Supports most industrial sensors
- Long Battery Life
- Rugged, Secure

- Global IoT Networks (150+ countries)
- Low-Cost Wireless Connectivity ($1/month)

LTE-M

NB-IoT

sigfox

3rd Party Data Source	SCADA / DCS /BMS Existing Sensors Historians, Rainfall Data

Proprietary AI / ML Algorithms for sewer blockage prediction

RESTful APIs

Rules Engine

Storage

User, Org, Access Management

Device Management

Multiple Connectors – MQTT, HTTPS, Sigfox, FTP etc

Cybersecurity

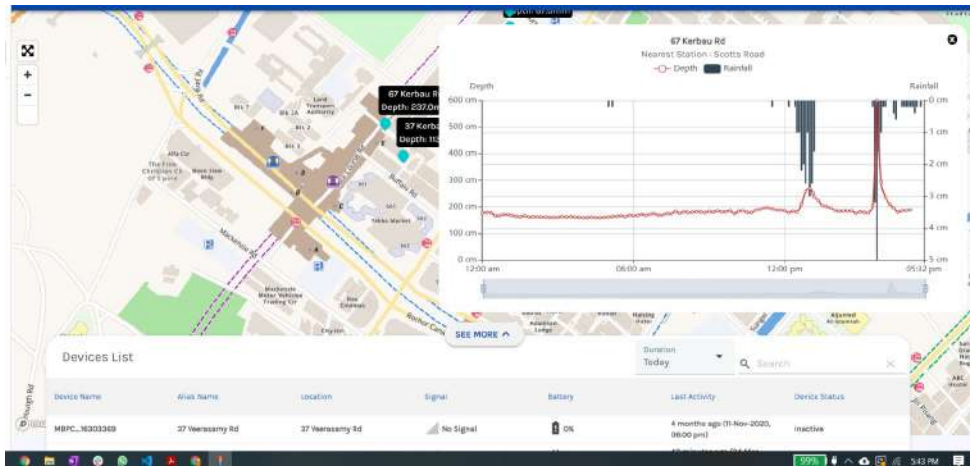
aws

rEye
Data-to-Insight Platform

Azure

Google Cloud

LTE-M
NB-IoT



Download on the App Store
GET IT ON Google Play

- **Proprietary Wireless IoT Device** to measure level, flow, quality in sewer network in real-time
- Long Battery Life
- Supports cutting edge wireless networks such as LTE-M, NB-IoT
- Rugged, Industry Grade hardware to survive harsh sewer conditions

- **Cloud based machine learning software** to monitor sewer conditions in real time and predict blockage / overflow scenarios
- Prediction model based on real time sensor data, sewer meta data and historical data
- Can be integrated with existing SCADA or other software
- Available on Web / Mobile

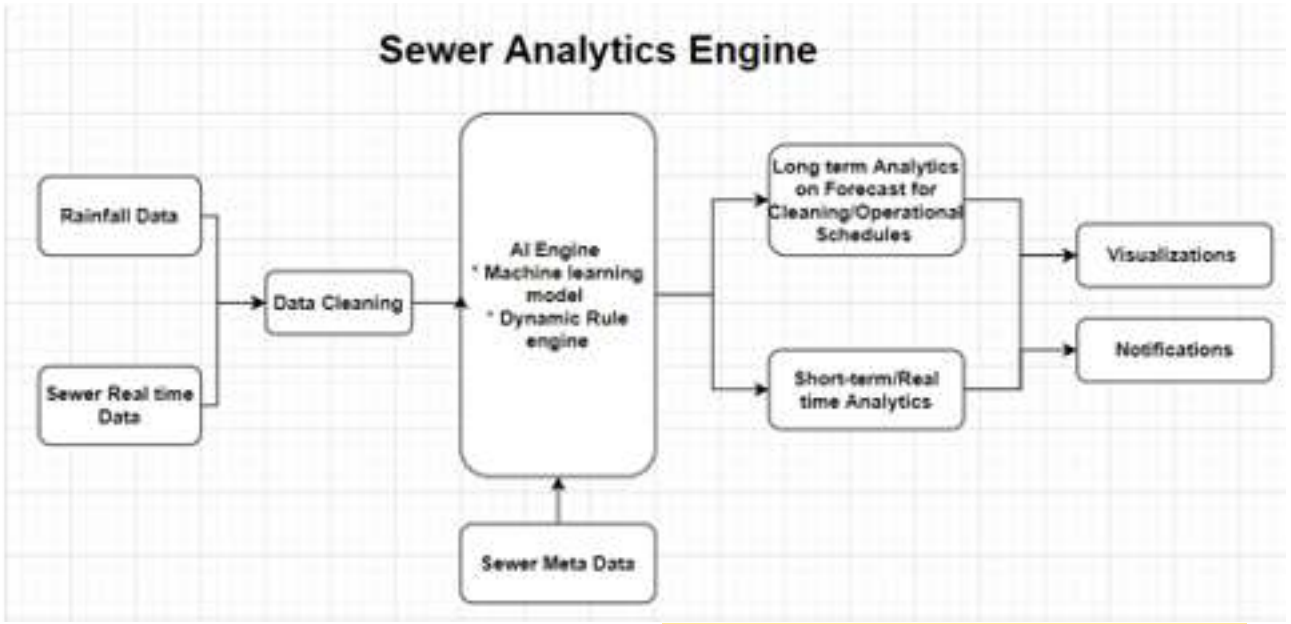
Detected 7 Blockage events
in the last 6 months

PUB SINGAPORE'S NATIONAL WATER AGENCY

SewerEye IoT Device inside the Manhole Chamber

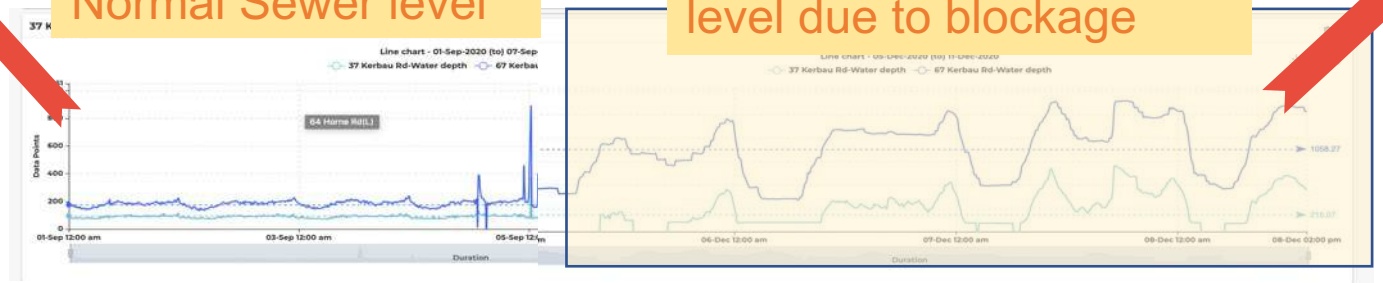
- Long Battery Life
- Wireless
- Rugged

LTE-M



Normal Sewer level

Surcharged or Abnormal level due to blockage



Sewer Level Trend at 67 Kerbau Rd showing the increase of base flow level over time

One unified platform for managing the wastewater collection network

Industries

Sewer Illegal Discharge Alerts

Inspection Chamber

ISO Tank Level Monitoring & Tracking

Greasy Waste Collection Tankers

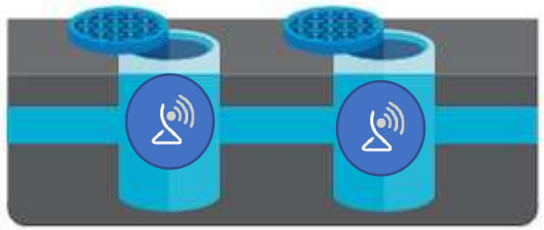
rEye IoT Device

- IoT devices installed along the Sewer Network / manholes and ICs at factories and construction Sites in Singapore

Households / Commercial Construction

Overflow Alerts

Grease Traps Holding Tanks



3500 km sewers
90k manholes

Sewer Blockage / Flow Monitoring

Wastewater Treatment Plant

Rainfall Inflow

Device to Insights: AI/ML based Smart Integrated Sewer network management

WQ / Illegal Discharge Detection at Factories

Level / Flow Monitoring at Sewer Manholes

ISO Tanker Level Monitoring & Tracking

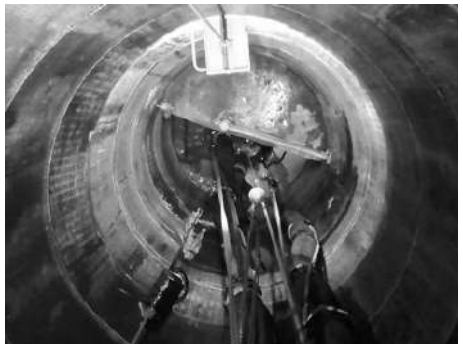
- **265** unique rEye Sensor Nodes installed along the Sewer Network / manholes and ICs at factories and construction Sites in Singapore
- 7 Sewer Blockage Events predicted
- >25 Illegal discharge events detected
- Substantial $$$ savings through prevention of pollution and sewer overflow events
- Predictive or condition based Maintenance instead of scheduled or break down maintenance

Water meter / **flow** monitoring

Water **leak** detection

Pump **condition** monitoring

Water Skid Process monitoring / control



Sewer / Drain level, flow, quality monitoring

Water **Quality** monitoring

ISO Tanker tracking / monitoring