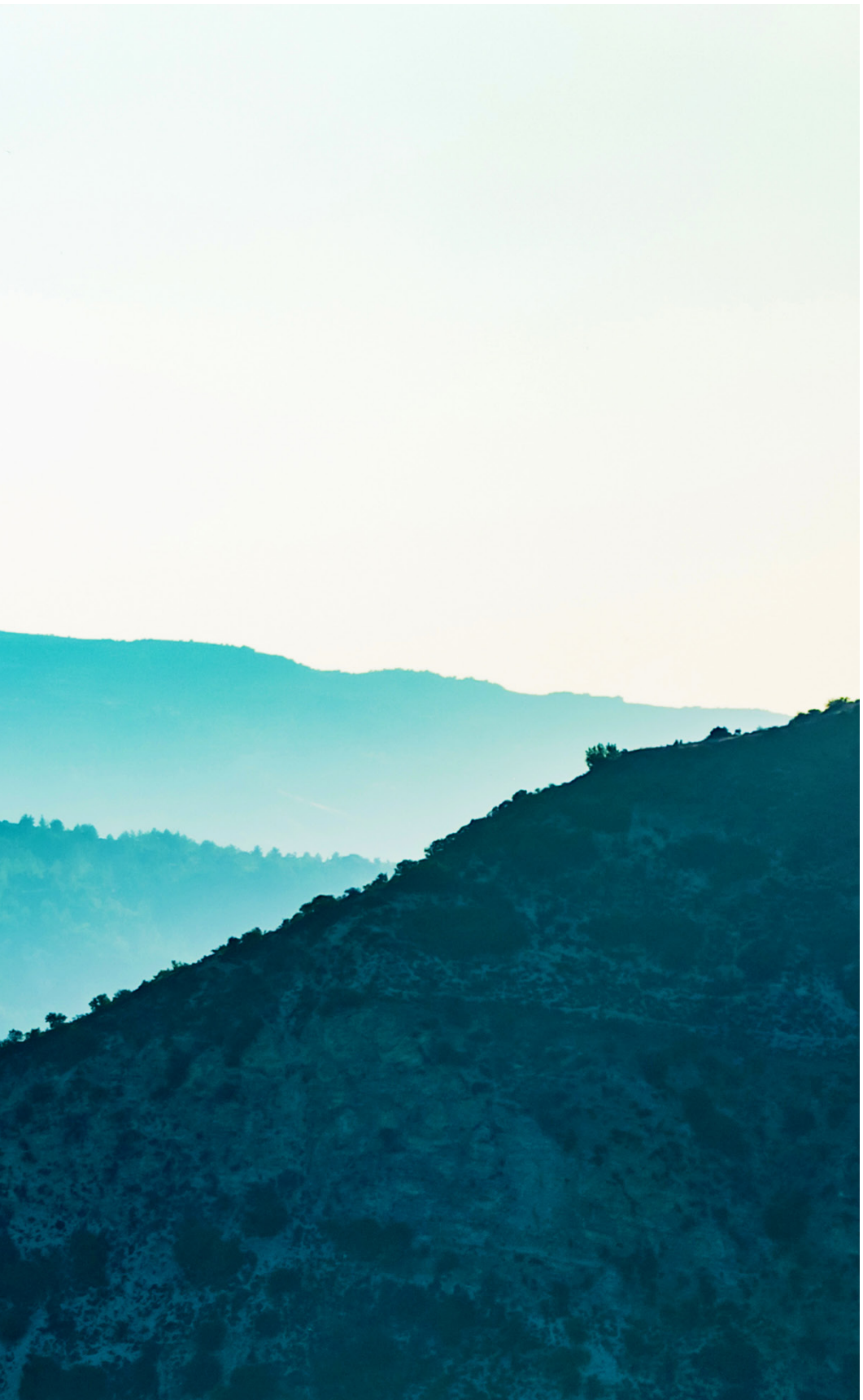
AYYEKA



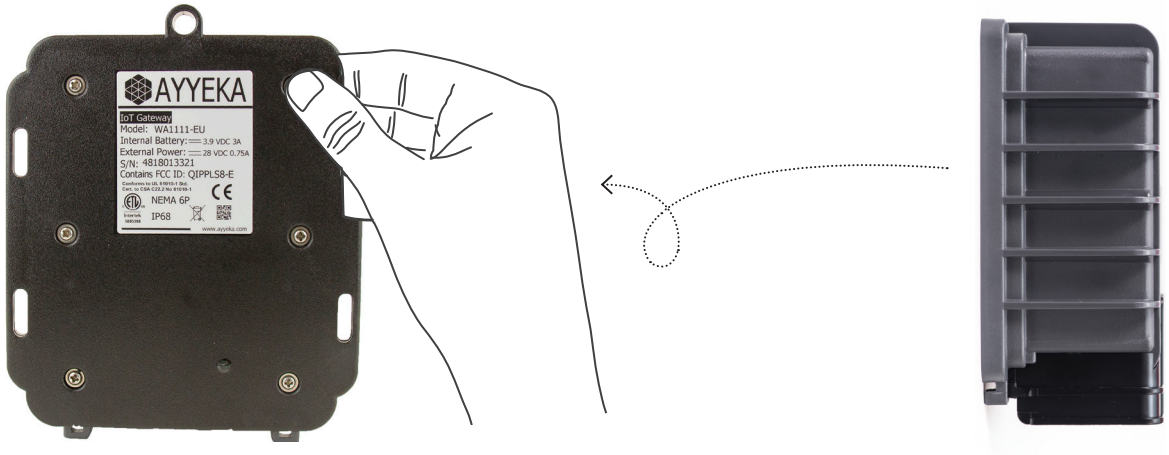
Hardware Brochure

WHAT IS THE Wavelet ?

Ayyeka's Wavelet is an Industrial Internet of Things (IIoT) device created to bring modularity and flexibility to the world of remote data acquisition.

The Wavelet is a secure, intrinsically safe and robust device that autonomously operates industrial-grade third-party sensors. The Wavelet operates using internal battery, solar power, or a permanent power source. Sensor data is generated and transmitted securely, then stored on Ayyeka's cloud-server or the customer's on-premises server. Data can be visualized and managed through Ayyeka's web-based graphical data management system, the StreamView, or integrated into third-party software applications and SCADA systems.

Following its introduction to the infrastructure market, the Wavelet is becoming a dominant IIoT solution for setting up cyber-secure, plug-and-play, affordable smart infrastructure networks.



AYYEKA'S TECHNOLOGY STACK: INTEGRATED, MODULAR, AND PRECONFIGURED/CUSTOMIZABLE

Software Applications & SCADA

StreamView Data Hub

Wireless Network Communication

Wavelet Device

Any Sensor

Physical Infrastructure & Environment

HOW DOES THE WAVELET WORK?

Wavelet Kits are comprehensive and streamlined solutions that deliver field data to decision makers. Wavelet Kits are comprised of sensors, the Wavelet device, a battery, a global SIM card, and installation hardware. A supplementary Ayyeka service plan includes network service, cloud-data storage, server and software integration support, and use of the Ayyeka Data Hub.

Sensors are either selected by Ayyeka or the customer. Alternatively, existing sensors can be upgraded with the Wavelet device, software, and service. Sampling and transmission rates can either be optimized using Ayyeka's predictive algorithms or programmed to meet customers' requirements.

Data collected with the Wavelet is encrypted and transmitted via secure communication over a variety of networks, including cellular, LPWAN (Low Power Wide Area Network), and Bluetooth. Due to its flexible architecture, data collected with the Wavelet can be stored on a cloud-server and/or on an on-premises server. Using Ayyeka's API, data can be integrated into the customer's SCADA system, business intelligence (BI) platform, or other analytics package.

The Ayyeka Data Hub enables over-the-air (OTA) fleet management and programming threshold levels with email, SMS, and voice alerts. In addition, data can be visualized in real-time and reports can be produced with a few clicks for presentation and analysis.

Using Ayyeka's Wavelet Kits, setting up your Wavelet system and starting data collection can be completed in as little as a few minutes.

Wavelet Activation In One-Minute

1. Unpack the contents of the Wavelet Kit box.

2. Connect the sensor cable connector to the Wavelet device.

3. Submerse the sensor in a container of hot water.

4. Place the Wavelet Activator on the Ayyeka logo for a few seconds.

5. Access home.ayyeka.com using your assigned log-in credentials.

6. Start viewing your data!

WHY CHOOSE AYYEKA?

Reduced Cost of Ownership

Ayyeka's all-in-one solution provides hardware, software, and services that reduce total cost of ownership. This solution is integrated, modular, and preconfigured to allow for plug-and-play installation (allowing startup in as little as a few minutes) and requires minimal maintenance.

Cyber-Security

In every layer, from the ground up, Ayyeka's solutions are embedded with the most advanced cyber-security technology. Protective features include data encryption and two-way authentication.

Software & SCADA

From cloud-based hosting or on-premises based solutions to secured and streamlined SCADA connectivity, Ayyeka provides all the tools needed to deliver data directly where it is needed. Integrating with models, analytics, and business intelligence (BI) solutions has never been easier.

Alerts & Tactical Edge Analytics

Process data, identify, and immediately respond to critical events at the device level in the field. Sample at regular or optimized intervals with advanced data acquisition technology and receive alert notifications via SMS, email, voice and in the SCADA system.

Versatility & Scalability

Collect any type of data using the sensor-agnostic Wavelet. Customize any feature to meet changing application and operational requirements. StreamView's user-friendly, powerful interface makes managing one device just as easy as managing a large-scale fleet.

Autonomous Operation & Redundant Communication

Low-power and predictive analysis algorithms result in up to 30% extended battery lifetime. Redundant communication concurrently supports 4G (LTE), 3G, 2G, LoRaWAN and Bluetooth.

Industrial-Grade & Intrinsically Safe

The Wavelet's UV-resistant polycarbonate enclosure complies with UL 94V-0 flammability standards and has a IP68 / NEMA 6P waterproofing rating. Intrinsic safety certification allows for installations in the most challenging and hazardous of environments.

Data & Software

Data Hosting	Secure Cloud or On-Premises
Cyber-Security	TLS 1.2 Protocol
Software Integration	REST API
SCADA Integration	CSV, DNP3, OPC-UA, FTP
Ayyeka IoT Platform Software	Web-based from desktop, tablet, and mobile
AyyekaGo Mobile App	iOS, Android
Data Export Options	CSV
Device Memory	8 GB
Data Communication	Two-way
Alarm Threshold	Up to 4 per data stream
Alert Notification	SMS, email, voice
System Health Check	Included

Power

Primary Power Supply	Internal Lithium Battery (field-replaceable and non-rechargeable), 3.9 V DC 3A
Internal Battery Capacity	32Ah
Operational Run Time	Up to 5+ Years*
Battery Status Notifications	Included
External Power	Solar and line power; automatic power source switching
Voltage Input	5-28VDC

Sensor Integration

Sensor Ports	3 ports; supports up to 10 sensors using cable splitters
Sensor Position	External Hard-Wired
Serial Interfaces	RS485, RS232, SDI-12
Serial Protocols	Modbus RTU, ASCII, custom
Serial Channels	Up to 16
Analog Channels	Up to 4 (4-20 mA, 0-27.5 V)
Discrete Channels	Dry contact, open collector Up to 3 total inputs (up to 2 pulse counting) 39Hz max pulse frequency Up to 1 output, max 2.8V
Sensor Power Supply Output	350mA, 12V

Connectivity

Communication Interfaces	Cellular (4G/3G/2G), LoRaWAN, Bluetooth
SIM Card(s)	Dual SIM slots
Cellular Roaming	Multi-network global SIM(s); data plan included supporting 140+ countries
Configuration & Upgrades	Remotely (over-the-air), USB PC connection
Data Transmission	Periodic, data-dependent
Antenna	External antenna support with backup internal antenna
Built-In GPS	Included

Mechanical Enclosure**

LED Indicator	Included
Dimensions (W x H x D)	13.2 cm x 16.5 cm x 7.3 cm (5.2 in. x 6.5 in. x 2.9 in.)
Weight	0.9 kg (2.0 lbs)
Enclosure Material	Polycarbonate (UL 94V-0 and UV-resistant)
Ingress Protection	IP 68 / NEMA 6P
Operating Temperature	-40°C to 80°C (-40°F to 176°F)
Storage Temperature	-40°C to 80°C (-40°F to 176°F)

Intrinsic Safety (optional)**

Approvals	USA/Canada Class I Div 1 Zone 0 ATEX Zone 0 IECEx
External Power	5-12VDC, 1.65 to 2.2A current limited
Max. Ambient Temperature	68°C (154°F)
Sensor Ports	3 Ports; cable splitters not permitted
Antenna	External antenna support only
Enclosure Material	Polycarbonate with ABS Alloy
Weight	1.0 kg (2.2 lbs)

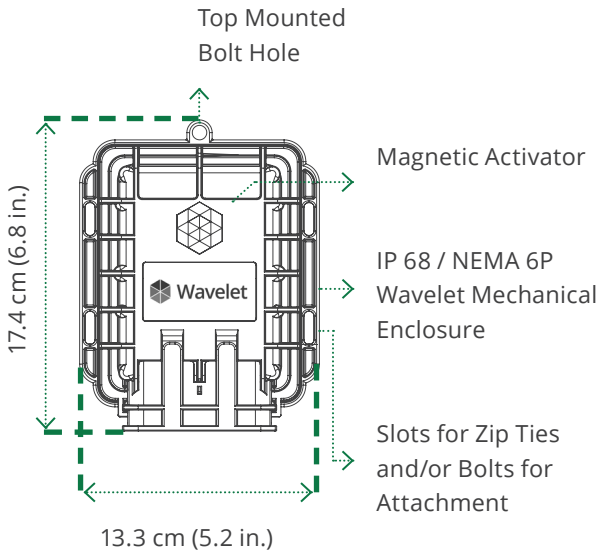
Class I Div 1, Groups C & D
II 1G Ex ia IIB T4 Ga IP68
IECEx Certificate No. IECEx ITL 18.0003X
Tamb = -40 +68°C

*Battery lifetime depends on sensor power consumption and sampling and transmission frequency.

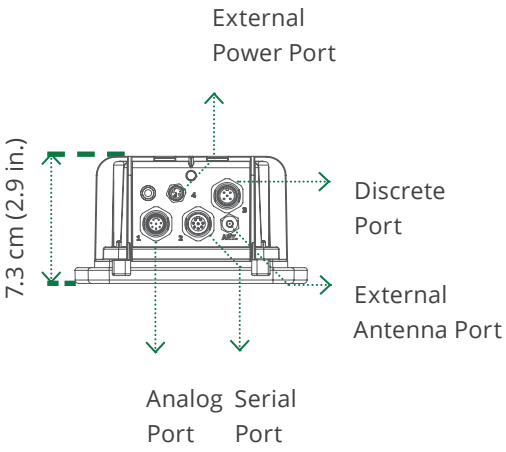
**Complies with: Radiated emission standards (ETSI EN 301 489-1/ -17 Class B and CFR 47 FCC Part 15 Subpart B Class B), Immunity per ETSI EN 301 489 1/-17 EN 61000-4-2, 3, 4, 5, 6, RoHS, Directive 2002/95/EC and CE.

WAVELET SPECIFICATIONS

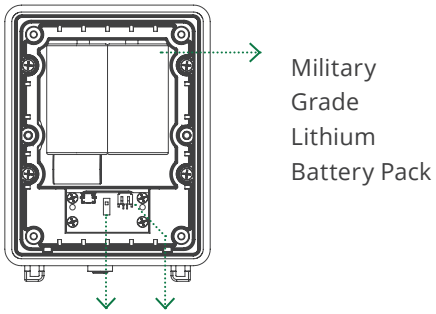
External (Front)



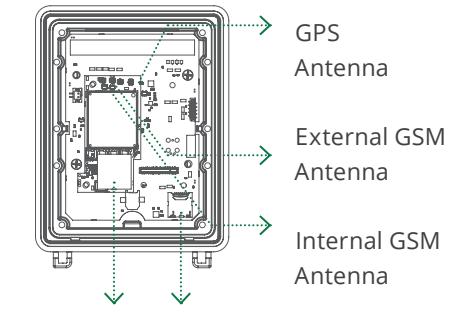
External (Bottom)



Internal (Layer 1)



Internal (Layer 2)



WAVELET IN EXPLOSIVE ATMOSPHERES

For use in explosive environments, we offer the Ayyeka Wavelet in an ATEX-certified version. This upgraded device has all the great features and unmatched flexibility of the original Wavelet (sensor interface, connectivity, software, etc.), and it offers the required protection for safe operation, in the most hazardous environments (i.e., gas).

Class I Div 1, Groups C & D
II 1G Ex ia IIB T4 Ga IP68
IECEx Certification No. IECEx ITL 18.0003X
Tamb = -40 +68°C

ATEX GROUPS

- Group II = All industries other than mining
- Group II Category = Category 1 (Zone 0)

EXPLOSION CLASSIFICATIONS

- Protection Code = Ex ia (Intrinsic safety - Zone 0 Gas)
- Gas Group = IIB (Test gas = Ethylene)
- Temperature Class = T4 (135°C surface temperature)
- Equipment Protection Level (EPL) = (“Very high”protection - safe after two consecutive malfunctions)
- IP Protection rating = IP68 (Dust-tight and Submersion to a specified depth over 100cm)

WHAT IS INTRINSIC SAFETY ACCORDING TO ATEX DIRECTIVE?

During normal operation and specified fault conditions, the circuitry cannot discharge sufficient energy into a spark or thermal event to cause ignition of the fuel. The fuel is able to enter the enclosure.

WHAT ARE THE COMMON GASES ACCORDING TO ATEX GAS GROUP IIB?

Coal gas (T1), Ethylene (T2), Ethyl Oxide (T2), Hydrogen Sulfide (T3).

WAVELET LPWAN

IIoT the industrial variant of IoT, is an emerging class of communications networks that has generated widespread excitement due to its ability to affordably connect large networks of 'things' (such as battery-operated sensors) to systems used to monitor and control industrial processes (SCADA systems).

LPWAN TECHNOLOGY OVERVIEW

Low Power Wide Area Networks (LPWAN), like LoRaWAN and Sigfox, are a family of wireless telecommunication networks designed to facilitate low power, low bit rate communications between network endpoints and servers. Even before commercial rollouts of telco-operated cellular IoT networks such as NB-IoT were widely available, LPWAN networks enabled industrial operators to leverage the benefits of IoT systems. Therefore, they have become more than a stop-gap on the journey towards cellular IoT and have become viable IoT communication technologies in their own right.

LPWAN ADVANTAGES

LPWAN networks are specifically optimized to facilitate minimum data and the connection of endpoints in Industrial IoT networks, and offer maximum battery life. Owing to the variety of difficult-to-access places in which they are often installed, endpoints cannot always be operated by fixed or solar power sources. As wide area network (WAN) technologies, LPWAN technologies can send information over long distances, and are effective also in urban environments, which present different challenges in comparison to rural environments, such as challenge of non line-of-sight radio transmissions to transverse.

LPWAN LIMITATIONS

LoRaWAN and Sigfox's key limitation is that they are uplink-only technologies. This is a crucial limitation for use-cases in which frequent endpoint software modulation is a requirement. Although a limited form of downlink is technically possible, they are not a suitable choice for network operators that, regularly alter transmission frequencies, push hardware and firmware upgrades over the air (OTA), configure their IoT devices frequently, for example, daily configuration of logic-based rules. A wastewater operator seeking to change the sampling interval of a device on an ongoing basis – perhaps in response to unpredictable meteorological events such as flash foods – may find that a LoRaWAN or Sigfox-powered solution does not meet technical requirements. It is however, a viable option when data requirements are minimal and do not require a reliable downlink. For example, for industrial operators, particularly those deploying simple-to-manage devices such as usage meters.

AYYEKA'S UNIQUE LPWAN OFFERING

Ayyeka's Wavelet makes the most of both cellular and LPWAN technologies. It has the advantages of high battery autonomies of sending essential data over LPWAN. At the same time, thanks to the advantages of cellular technologies, the Wavelet offers remote management of your installed base, such as configuration changes and firmware upgrades over the air (OTA).

THE WAVELET: WHAT IS INCLUDED

The Wavelet is a unified solution for generating data from virtually any type of infrastructure or asset. Ayyeka offers a variety of Wavelet Kits, or you can design your own kit, according to the desired measurement parameters, type of power source, as well as connectivity, data storage, and data integration preferences.

Pre-configured and ready to use out-of-the-box, the device comes with a magnetic activator, installation hardware, and any accessories needed to support the use case. Once the sensor and antenna are installed and connected to the Wavelet, the system can be activated using the Wavelet activator. The 15-minute activation sequence can be monitored and managed using Bluetooth pairing with AyyekaGo (in the field device installation and management mobile app).

Embedded GPS enables geo-location and mapping in the StreamView data hub. Continuous time-stamped data is transmitted from the device almost immediately. Device settings, including sampling and transmission intervals, as well as threshold alerts can be configured over-the-air.

Ayyeka is committed to continuous innovation. We welcome inquiries for incorpating new technologies and extending our product and solutions offering.

MEASUREMENT PARAMETERS:

Physical
Current
Door Position
Flow
Humidity
Incline
Level
Precipitation
Pressure
Soil Moisture
Solar Insolation
Temperature
Vibration
Wind Speed

Chemical
Conductivity
Dissolved Oxygen (DO)
Hydrogen Sulfide (H2S)
ORP
Particulate Matter (PM)
pH
Salinity
Total Suspended Solids (TSS)

WAVELET CONFIGURATION:

Power
Internal battery
External battery
Solar panel assembly
Line power

Communication
Cellular (4G/3G/2G)
LoRaWAN (optional)
Bluetooth

Antenna
External
Internal (backup)

Server
Cloud
On-Premises
Hybrid

DASHBOARD:

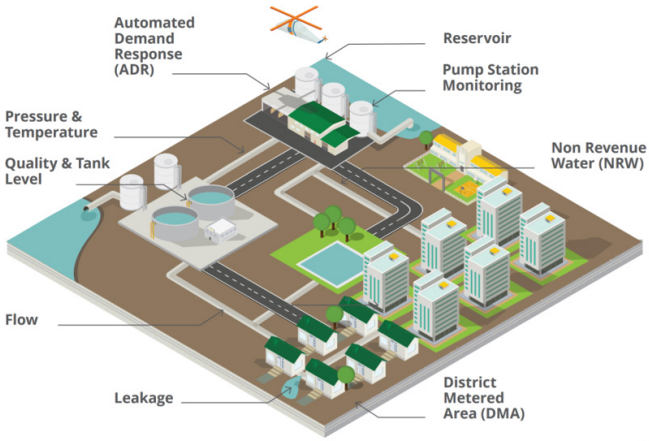
StreamView data hub
Desktop
Tablet
Mobile

SCADA
CSV
DNP3
OPC-UA

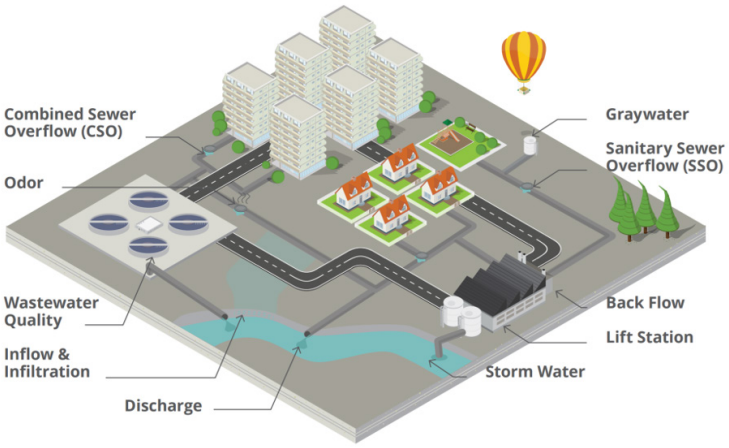
API
REST

SMART INFRASTRUCTURE NETWORKS

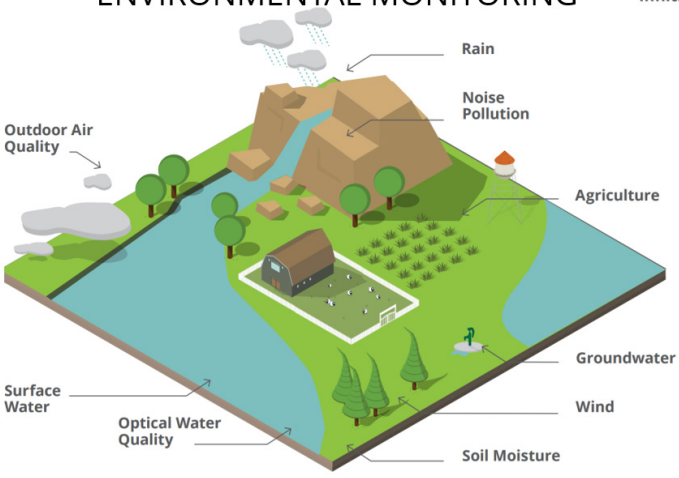
WATER SUPPLY & QUALITY



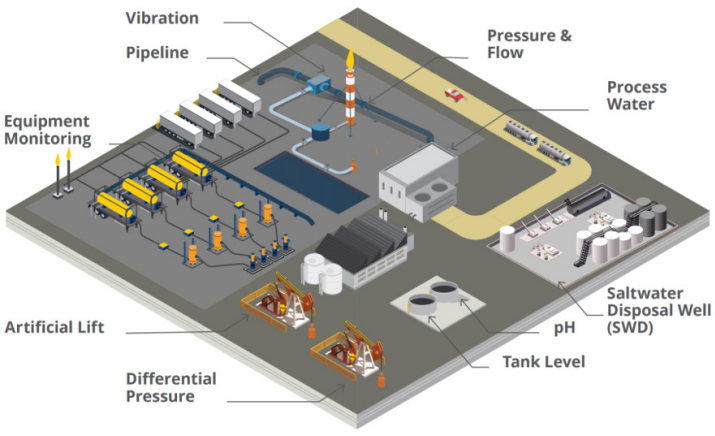
WASTEWATER



ENVIRONMENTAL MONITORING



OIL & GAS AND INDUSTRIAL ASSETS



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