OTT HydroMet
Insights for Experts

IMPORTANCE OF NUTRIENT MONITORING

What **nitrates** tell us about the water we rely on

WHAT IS NUTRIENT MONITORING ALL ABOUT?

The Application – Fresh Water

Freshwater represents only 3% of Earth‘s water, yet is needed to sustain life.

- Surface water, although considered renewable, is largely dependent on precipitation, overland runoff, groundwater seepage, and tributary inflows
- Living organisms depend on their water supplies being safe for consumption
- Industrial systems in place also require clean, uncontaminated water supplies for various recreational and business applications

What does nutrient monitoring currently look like, and where is it headed?

Current Trends	Future Trends
Low temporal frequency monitoring, often combined with modelling » Vulnerable to uncertainties because sites may be monitored less » Labor intensive to manually collect discrete samples » Not equipped to measure episodic events, which are time sensitive and unpredictable	Continuous monitoring of nitrate measurements » Increased spatial data density » Improved models for strategic investment » Effective prioritization of infrastructure investments Rising importance of nutrient status among stakeholders

WHY IS NUTRIENT MONITORING IMPORTANT?

What is the scope of the issue?

- Human activity increases natural amounts of nitrate in water to create **nitrate loading**, which can affect plant growth, reproduction cycles, and the life of species
- Some nutrients applied to the land surface infiltrate into underlying **groundwater**, which can eventually run into streams and lower existing levels of dissolved oxygen
- Nitrate can cause rapid increases in **algae population** which can kill organisms and submerged plants, with serious negative impacts on shore lines and aquatic organisms

What is the source?

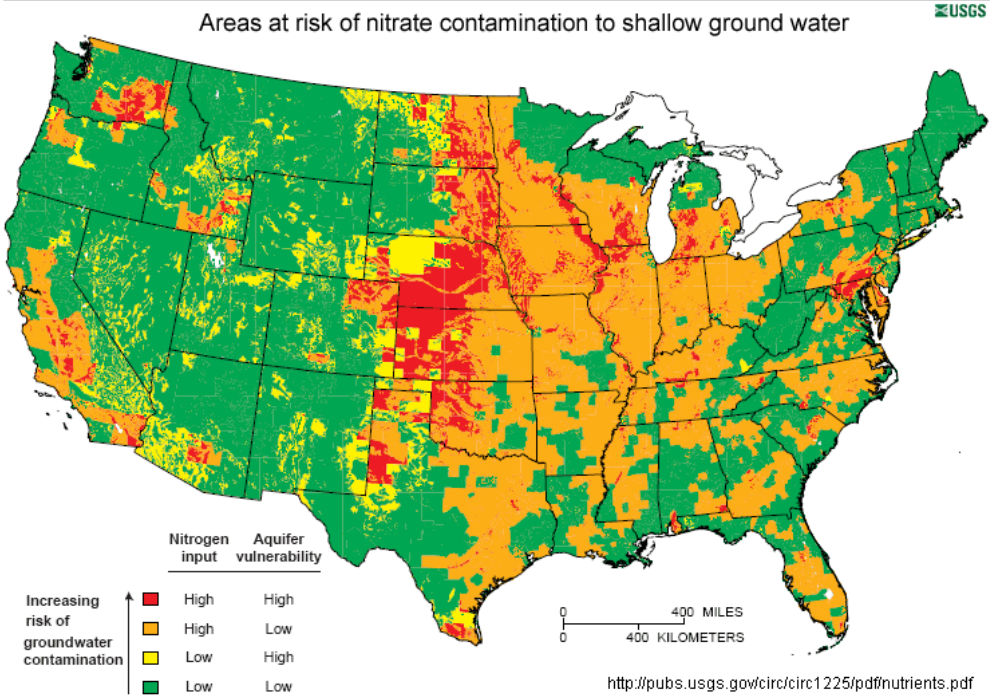
- Waste water – other anthropogenic sources
- Leaching from manure or artificial fertilizers
- Storm water runoff

At-Risk Areas in the US

By observing the flow of nitrate loading to groundwater sources, we can determine:

- Which areas are most affected
- Where to focus data monitoring and conservation efforts

USGS Groundwater



http://pubs.usgs.gov/circ/circ1225/pdf/nutrients.pdf

Credit: U.S. Geological Survey
Department of the Interior/USGS

THE IMPORTANCE

Identifying high nitrate concentrations is critical for assessing how nitrates are processed in surface water and for protecting the environment and lives.

Proactive alerts

- It is far more cost-effective to prevent contamination in the first place than treat existing contamination
- Smart monitoring is essential to be aware of dangerous nitrate levels and anticipate upcoming issues

How effective are current pollution reduction strategies?

- Room for improvement – current reduction is highly dependent on costs, sensor technology, maintenance requirements, and data management capability

What is Being Done?

Current monitoring programs typically rely on

manual spot checking

for discrete samples from the field on a weekly or monthly basis for laboratory analysis

Weekly or monthly sampled data is

less representative

of waterbody being measured when it comes to nitrate concentrations and trends observed in the water

When data is less representative, it may

decrease the effectiveness

of practices and insights towards controlling nitrate contamination

WHAT CAN BE DONE?

Continuous Data Monitoring

Increasing need for **continuous** data driven by necessity for more effective water management and conservation practices to improve quality of life and the environment

More temporal data = Capture variability and lower uncertainty

» Utilizing more data than ever, both spatial and temporal, to improve management and quality of water resources

New technology = Low maintenance UV sensors that measure nitrate in **real-time**

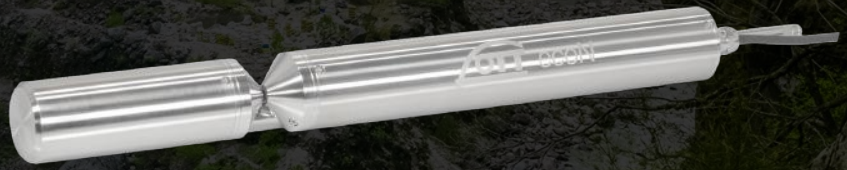
» By monitoring nutrient concentrations 24/7/365, you can see fluctuations from seasonal runoff, precipitation, and episodic events

Lower cost = Time series data at a **lower cost per data point**

» Accurately identifying every peak in nutrient concentration is key

Introducing the OTT ecoN

NEW GENERATION OF UV NITRATE SENSORS



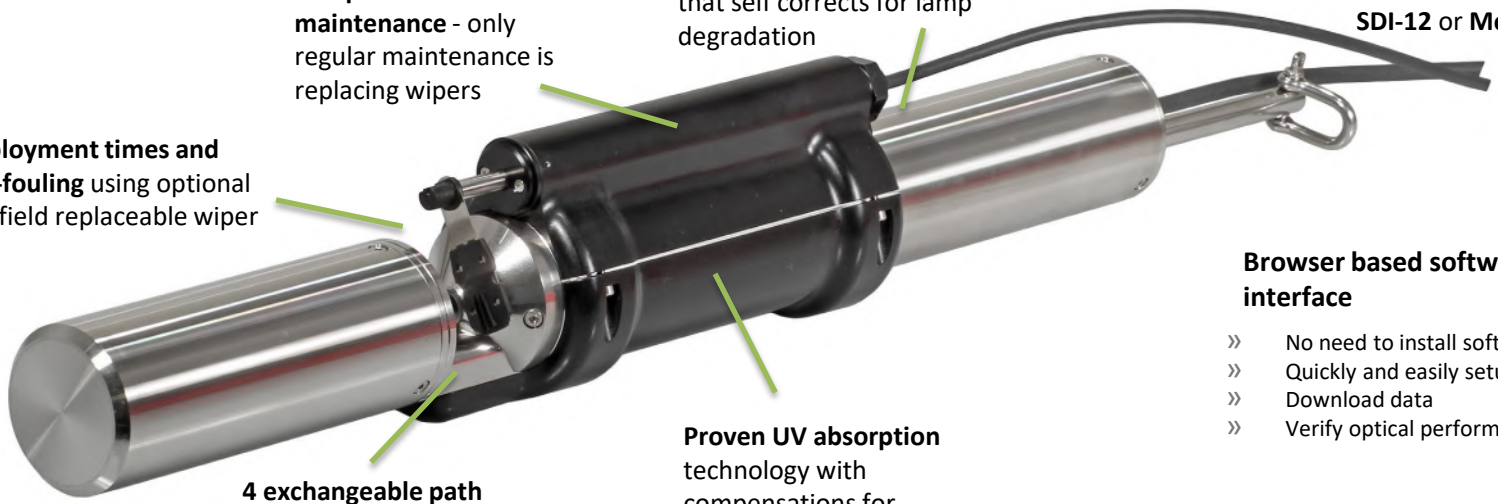
Important – this sensor is only for use in environmental fresh surface water and groundwater applications

The OTT ecoN UV Nitrate sensor is designed for optical determination of nitrate (NO3-N) in fresh surface and groundwater.

- **Proven field reliability** using the absorption method which provides high accuracy, minimizes drift and eliminates bias
- **Easy-to-operate** with browser-based software and modular design
- **Reduces annual maintenance** requirements to typical cleaning and exchange of wiper blades (if using optional wiper)
- **Ensures data quality** by including quality indicators with each measurement

Key Features

Advancing the legacy of industry-leading nutrient sensors, the OTT ecoN UV nitrate sensor for continuous use in fresh water combines field reliability and low maintenance with browser-based software to deliver lower operational cost.



No specific annual maintenance - only regular maintenance is replacing wipers

High Quality flash lamp that self corrects for lamp degradation

Use with common external dataloggers via **SDI-12** or **Modbus**

Extend deployment times and reduce bio-fouling using optional wiper with field replaceable wiper blades

Browser based software interface

- No need to install software
- Quickly and easily setup
- Download data
- Verify optical performance

4 exchangeable path lengths fitting to variety of nitrate concentrations and turbidity conditions

Proven UV absorption technology with compensations for turbidity and organic interferences

Monitoring Nitrate with OTT ecoN

Synoptic measurements for nitrate source detection

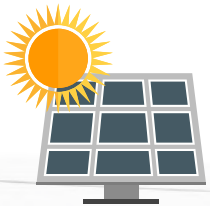
- Supports mobile applications with use of 2-GB internal datalogger and light-weight design
- **Example:** Use from a boat or kayak for monitoring nitrate while moving upstream

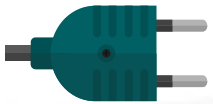
Short-term monitoring deployments

- Easily deploy from bridge or river bank mounted rail system for seasonal nitrate monitoring or during storm events
- **Example:** Temporarily install in vertical pipe connected to 12 V DC battery and 30 W solar panel

Long-term continuous monitoring

- Install from river bank rail mount or bridge for year-round monitoring
- **Example:** Connect sensor to Sutron SatLink or OTT netDL to collect and transmit measurement and quality data remotely





Field Operation

1

Place the sensor in the field. ecoN features include:

- » Detection of NO3-N using absorption at 212 nm
- » Measure timing of < 10 seconds
- » SQI - signal quality indicators available

Verify sensor readings using common nitrate standards

2

Connect to program logger to collect measurements at desired measurement frequency and trigger wiper

Field Operation

3

Connect to a datalogger via SDI-12 or Modbus*

Operate with 12 V DC battery and 30 W solar panel

4

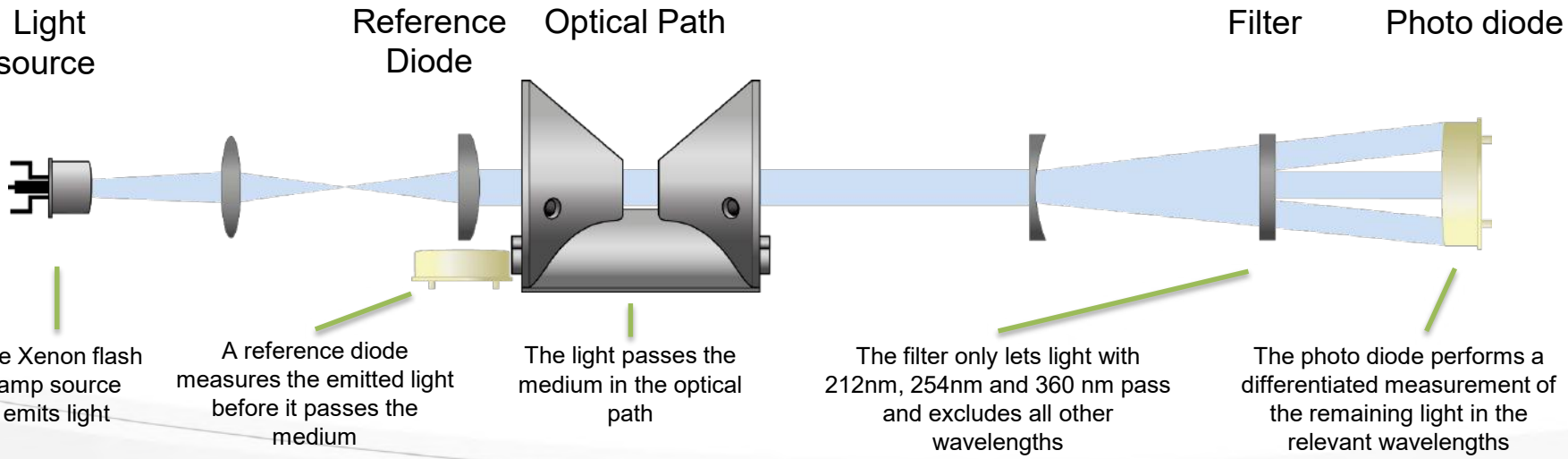
Connect directly to the sensor using browser based software and G2 interface

Cable with pigtail for connecting to datalogger – additional segments to increase length

* Python scripts available for use with Sutron SatLink or XLink 100 / 500

Precise Optical Technology

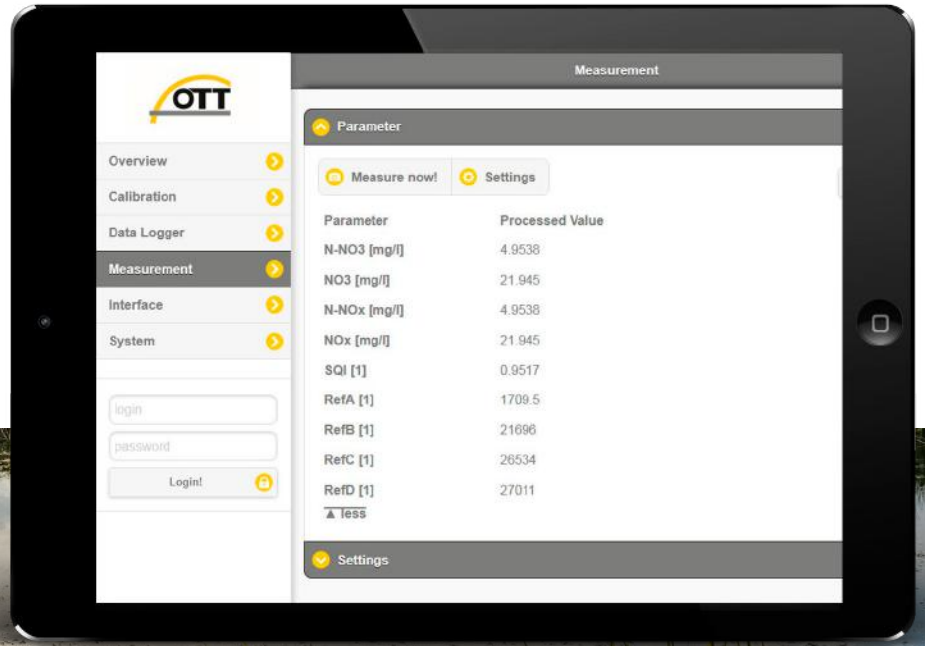
- Reference signals provides greater accuracy by minimizing drift and eliminating bias
- Self corrects for variation of lamp output
- Helps ensure data quality



QA/QC

Signal Quality Indicator (SQI) available with each measurement

- Reference scale 0.000 to 1.000
- < 0.800 will typically provide good data
- Transmit with measurement data to identify blocked pathway or build-up on lens from back in the office



Calibration verification for quality assurance

- Use standard solutions to verify performance and provide traceability
- Verify zero baseline using ultrapure water

OTT ecoN Converter

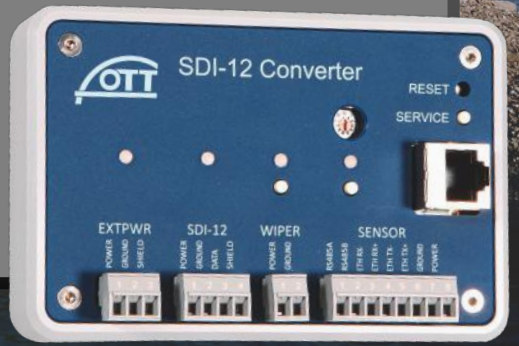
OTT ecoN Modbus to SDI-12 Protocol Converter

The SDI-12 converter allows you to remotely access your data with ease by acting as an interface between your OTT ecoN sensor and the SDI-12 interface of the peripherals.

Receive continuous information on the current operation mode and power supply, thanks to the converter's four status LEDs.

Enjoy remote configuration through the Ethernet interface and measurement controls.

- Low standby power of < 20 mW to operate with just a battery
- Four status LEDs for current operation mode and power supply info
- Ethernet interface allows for data export and sensor configuration via web interface
- Controls measurements with G2 sensors and wiper cleaning cycles
- Three modes for Sensor Scan, Wiper Cleaning, and Service Mode



Anti-Fouling Wiper

Decreases total cost of ownership and improves data quality using optional wiper

- Increases deployment times and reduce number of site visits for routine cleaning or maintenance due to bio-fouling
- Minimizes likelihood of noisy data
- Nano coating also reduces biofouling and prolongs life of the lens

Simple to exchange wiper blades on-site

Easy-to-use wiper blade kit

THE END USE

The OTT ecoN for continuous use in fresh water combines field reliability and low maintenance with browser-based software to reduce drift and eliminate bias.

By generating **instantaneous insights on environmental water quality**, you can establish baseline ranges and capture general trends over time. These datasets are key for pollution reduction/control strategies and protecting water resources for a better future.

Contact us for more information on Nutrient Monitoring Solutions

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