USE OF SPECTROPHOTOMETRIC AND FLUROMETRIC SENSORS TO MEASURE IN-STREAM CONSTITUENTS IN NEW JERSEY

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USGS NJWSC currently operates 17 water quality monitors

Most collect traditional field parameters:

- Water Temperature
- Specific conductance
- pH
- Dissolved Oxygen Concentration
- Turbidity
Spectral Sensors deployed at a select group of stations

Passaic river Below Pompton River at Two Bridges, NJ

Toms River at Toms River, NJ

Barnegat Bay at Route 528 at Mantoloking, NJ
Spectral Sensors

**Nitrate**

*S::CAN Spectrolyzer*

Passaic River and Toms River

**Chlorophyll**

*bbe Algae Guard (bench top unit)*

Passaic River

*bbe Fluoroprobe (submersible unit)*

Barnegat Bay

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Operating principles

Nitrate Sensor

Dissolved compounds (i.e. Nitrogen, DOC) are **absorbed** at specific wavelengths of light over the ultraviolet to visible spectrum.

This **absorbance** can be measured and converted to concentrations of various compounds (Nitrates, DOC, TOC, Turbidity).

Chlorophyll Sensor

Algae groups have a unique combination of pigments which **fluoresce** at different wavelengths.

The intensity of the **fluorescence** can be measured and converted to the total chlorophyll concentration.
Operation and Maintenance issues

1. Water matrix effects
   - Calibration issues
   - Dissolved Organic Carbon

2. Fouling of optical windows
Instruments calibrated at the factory, but may need to be calibrated to local water matrices.

Using the equation of the trend line:

\[ y = 1.295x - 0.5628 \]

\[ R^2 = 0.9921 \]

Can recalibrate the S::CAN Internally (bbe?).

Can adjust the data externally in the USGS Automated Data Processing System (ADAPS).
Water matrix effects – High DOC

High Dissolved Organic Carbon
Toms river

DOC, mg/L

Nitrite + nitrate, mg/L as N

Long optical path
35 mm

Shorten optical path length
15 mm
Fouling of optical windows

Optical window fouling – Passaic

Cleaning Jets

Optical window fouling – Toms River sediment

Optical window fouling – Barnegat

DI water

Compressed Air
Instrument Upgrades

Passaic River Monitor

• Sensors installed in 2009 and 2010 respectively.
• First station in NJ to have long-term deployment.
• Unable to convert instrument readings to transmittable formats.
• Local calibration of S::CAN could only be done remotely by a company technician.
• Length of the S::CAN optical path is permanent; need to send back to factory for modifications.

Toms River and Barnegat Bay

• Sensors installed in 2011 – newer generation with improved features.
• Can transmit data over Serial Data Interface (SDI-12)
• Can recalibrate the S::CAN on-site.
• Can reduce the length of the S::CAN optical path by inserting fittings.