



# Laboratory Solutions for Nutrient Pollution

# Nutrient Pollution & Water Quality



## Background

In 1998 the U.S. Environmental Protection Agency issued a National Strategy for Development of Regional Nutrient Criteria to help states in developing nutrient water quality standards for lakes, reservoirs, rivers, streams, wetlands, estuaries, and coastal waters.<sup>1</sup> The European Commission took similar action in Directive 91/676/EEC which requires member states to identify nitrate vulnerable zones (NVZs) and take steps to monitor, control, and reduce water pollution from excessive use of fertilizers.

In characterizing the problem of nutrient pollution, the USEPA stated; "Cultural eutrophication (human-caused inputs of excess nutrients in waterbodies) is one of the primary factors resulting in impairment of surface waters in the US."<sup>2</sup> Nutrient pollution reduction is a priority for USEPA regions because states have listed over 10,000 nutrient-related Clean Water Act Section 303 (d) impairments.<sup>3</sup>



## Permits & Monitoring

Reduction of nutrient pollution levels requires monitoring and control of the major sources of excess nutrients. Point sources of nutrient discharge include municipal and industrial wastewater facilities, stormwater runoff, and some large animal feed operations. Nutrients discharges from point sources are controlled through National Pollutant Discharge Elimination System (NPDES) permits. Nutrient discharges from nonpoint sources such as crop and livestock production, and storms are irregular and seasonal in nature.

Several factors make monitoring of nutrient pollutants a challenging analytical task. Water must be analyzed at multiple locations, because the physiochemical properties of samples from water treatment facilities are considerably different than samples from lakes, rivers, wetlands and marine environments. The concentration of nutrients in samples from impaired and unimpaired water bodies can vary significantly. Nutrient levels can also fluctuate seasonally, and after storms. In some cases, (e.g.; pore water from marine sediments), the amount of sample available for testing may be limited. Sample pretreatment and/or analytical procedures may require adjustments to address these factors.



## Regulatory Compliance

OI Analytical has developed a comprehensive set of nutrient analysis methods for regulatory compliance testing, and collection of research data necessary to establish numeric nutrient criteria for natural water ecosystems.

### Drinking Water / Wastewater

Analyte	Technique	Range*	Detection Limit	Reference Methods
Ammonia	FIA/SFA	0.01 - 25 mg/L	0.001 mg/L	EPA 350.1 / ISO 11732
Nitrate/Nitrite	FIA/SFA	0.005 - 10 mg/L	0.002 mg/L	EPA 353.2 / ISO 13395
Nitrite	FIA/SFA	0.01 - 10 mg/L	0.002 mg/L	EPA 353.2 / ISO 13395
Nitrogen -TKN	FIA/SFA	0.05 - 20 mg/L	0.01 mg/L	EPA 351.2
ortho-Phosphate	FIA/SFA	0.01 - 5.0 mg/L	0.001 mg/L	EPA 365.1 / ISO 15681-1
Total Phosphorus	FIA/SFA	0.01 - 20 mg/L	0.003 mg/L	EPA 365.4 / ISO 15681-1
Carbon - TOC	Wet Oxidation/ Combustion	10 ppb - 30,000 ppm	2 ppb	SM-5310-B/C / ISO 8245

### Seawater

Analyte	Technique	Range*	Detection Limit	Reference Methods
Ammonia	SFA	0.10 - 5.0 $\mu$ moles/L	0.077 $\mu$ moles/L	EPA 349.0
Nitrate / Nitrite	SFA Cd-reduction	0.02 - 40 $\mu$ moles/L	0.007 $\mu$ moles/L	EPA 353.4
ortho-Phosphate	SFA ascorbic acid	0.02 - 10 $\mu$ moles/L	0.009 $\mu$ moles/L	EPA 365.5
Silica	SFA	0.35 - 35 $\mu$ moles/L	0.071 $\mu$ moles/L	SM 4500 - SiO <sub>2</sub> E

### KCI Extracts

Analyte	Technique	Range*	Detection Limit	Reference Methods
Ammonia	FIA/SFA	0.1 - 25 mg/L	0.02 mg/L	EPA 350.2
Nitrate / Nitrite	FIA/SFA	0.1 - 10 mg/L	0.02 mg/L	EPA 300.0
Nitrite	FIA/SFA	0.1 - 10 mg/L	0.02 mg/L	EPA 353.2



\* Measurement ranges may be extended to analyze higher concentrations by sample dilution



# Nutrient Analysis Solutions

## FS3700 Automated Chemistry Analyzer

As the fastest continuous flow analyzer on the market, the FS3700 offers low cost of operation and an uncompromising lower detection limit for any analyte. Numerous methods are available to suit the needs of your application.



## Aurora 1030 TOC Analyzers

Perform total organic carbon analysis using heated persulfate wet oxidation or high temperature catalytic combustion techniques.

An optional TN<sub>b</sub> analysis module is available to measure total bound nitrogen in water samples.



## 1080 TOC Analyzer

Our lowest cost of operation TOC system is tailor-made for traditional analysis. Experience unparalleled operation with our updated TOCView software, and reduce downtime with patented technologies like the Catalyst Tube Guard and Smart Slide Injector.



## References

<sup>1</sup> Federal Register, Vol. 63, No. 122, June 25, 1998.

<sup>2</sup> Draft Nutrient Criteria Technical Guidance Manual, USEPA, EPA-823-B-05-003, December, 2006.

<sup>3</sup> Nutrient Pollution and Numeric Water Quality Standards, USEPA Memorandum, May 25, 2007.

USEPA Nutrient Water Quality Criteria website; [www.epa.gov/waterscience/criteria/nutrient](http://www.epa.gov/waterscience/criteria/nutrient)

European Commission Environment website; <http://ec.europa.eu/environment/water/water-nitrates/directiv.html>



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