**Scope**

This method is used for determining Total Kjeldahl Nitrogen (TKN) in drinking water, surface water, and domestic and industrial wastes according to USEPA Method 351.2 and Standard Methods 4500–$N_{org}$ D. This method can also be used for the determination of TKN in potassium chloride (KCl) extracts of soils and plants.

**Summary**

Digest the sample prior to analysis in the presence of sulfuric acid, potassium sulfate, and a mercury catalyst at a final temperature of 380 °C. Free ammonia and organic nitrogen compounds convert to ammonium sulfate under these conditions. Copper catalysts can be used, however, the green color of the catalyst interferes with the method. The ammonium reacts with salicylate and hypochlorite in a buffered alkaline solution in the presence of sodium nitroferricyanide (pH 12.8–13) to form the salicylic acid analog of indophenol blue. Measure the blue-green color produced at 660 nm.

**Interferences**

Eliminate precipitation of calcium and magnesium hydroxides by adding potassium sodium tartrate in the working buffer. Filter or centrifuge turbid digestates prior to the analysis. Digestates with background absorbances at the analytical wavelength may interfere with the analysis. Mercury interference is minimized by complexation with chlorine ion.

**Performance Specifications**

| | |
|---|---|
| Range: | 0.05–20.0 mg/L |
| Throughput: | 55 samples/hour |
| Precision (at 1.0 mg/L): | <1% RSD |
| Precision (at 5.0 mg/L): | <1% RSD |
| Method Detection Limit (MDL): | 0.01 mg/L |
| Accuracy*: | 99% |

*Undigested; ERA (Environmental Resources Associates) WasteWatR Simple Nutrients Quality Control Sample.

**Chemicals**

Ammonium Sulfate, $(NH_4)_2SO_4$

Chloroform, $CHCl_3$

Deionized Water (ASTM Type I or II)

Hydrochloric Acid, concentrated, HCl

Potassium Sodium Tartrate Tetrahydrate, $KNaC_4H_4O_6 \bullet 4H_2O$

Potassium Sulfate, $K_2SO_4$

Red Mercuric Oxide, HgO

Sodium Chloride, NaCl

Sodium Hydroxide, NaOH

Sodium Hypochlorite, 5.25% available chlorine (OI Analytical does not recommend household bleach), NaOCl

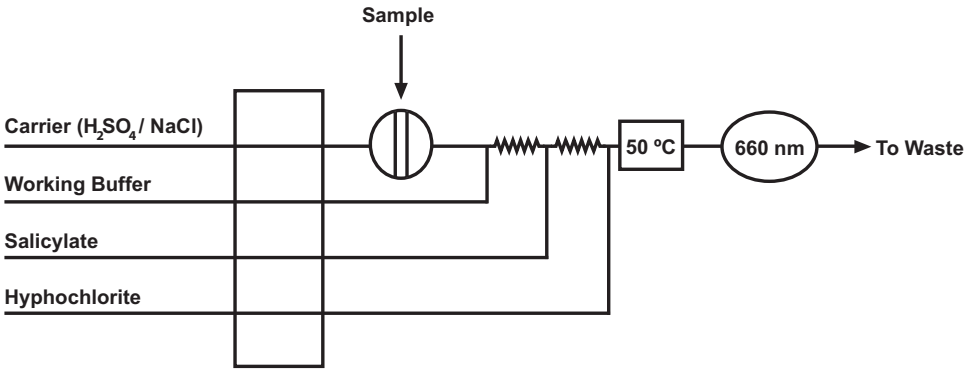
Sodium Nitroferricyanide Dihydrate, $Na_2Fe(CN)_5NO \bullet 2H_2O$ (FW 297.95)

Sodium Phosphate Dibasic Anhydrous, $Na_2HPO_4$

Sodium Salicylate, $NaC_7H_5O_3$

Sulfuric Acid, concentrated, $H_2SO_4$

## Basic Flow Diagram




**Note**

This method complies with USEPA Method 351.2.

**Selected References**

*Methods for Chemical Analysis of Water and Wastewater*; EPA–600/4–79–020; U.S. Environmental Protection Agency, Office of Research and Development, Environmental Monitoring and Support Laboratory: Cincinnati, OH, 1984; Method 351.2.

*Standard Methods for the Examination of Water and Wastewater*, 21st ed.; American Public Health Association: Washington, D.C., 2005.

**Figures**

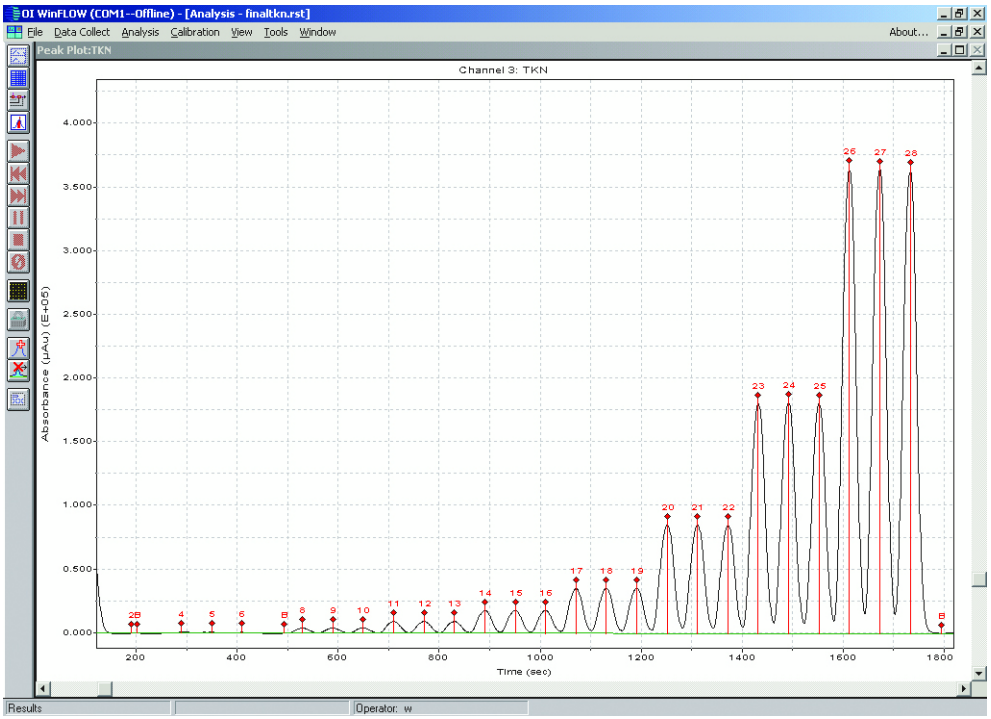



Figure 1. TKN Calibration (0.05–20 ppm)

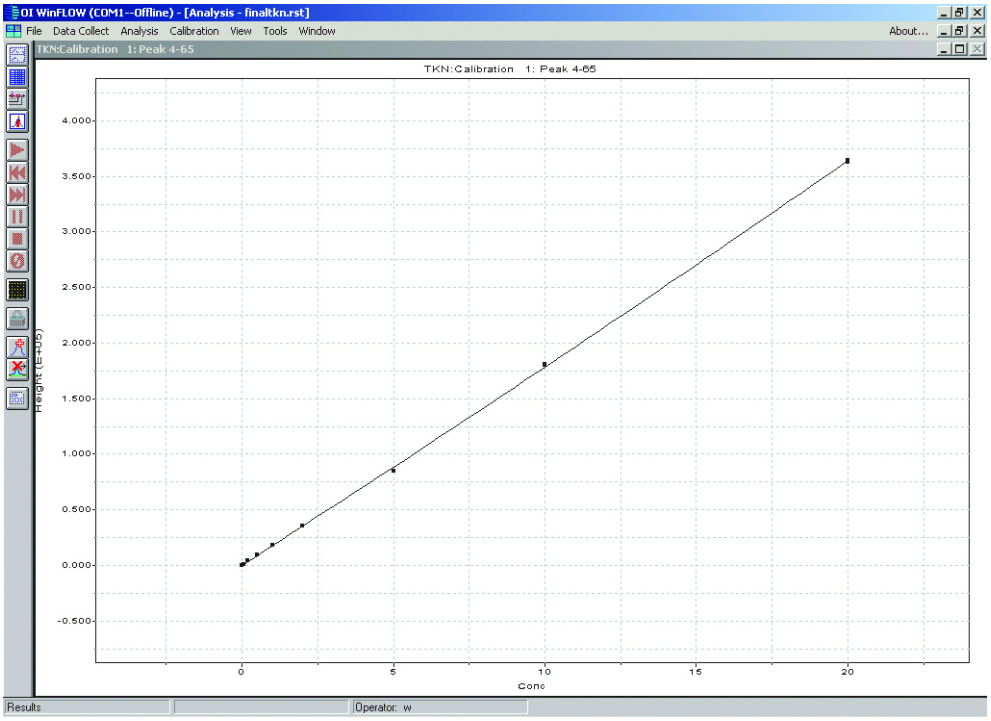



Figure 2. TKN Calibration Curve (0.05–20 ppm)

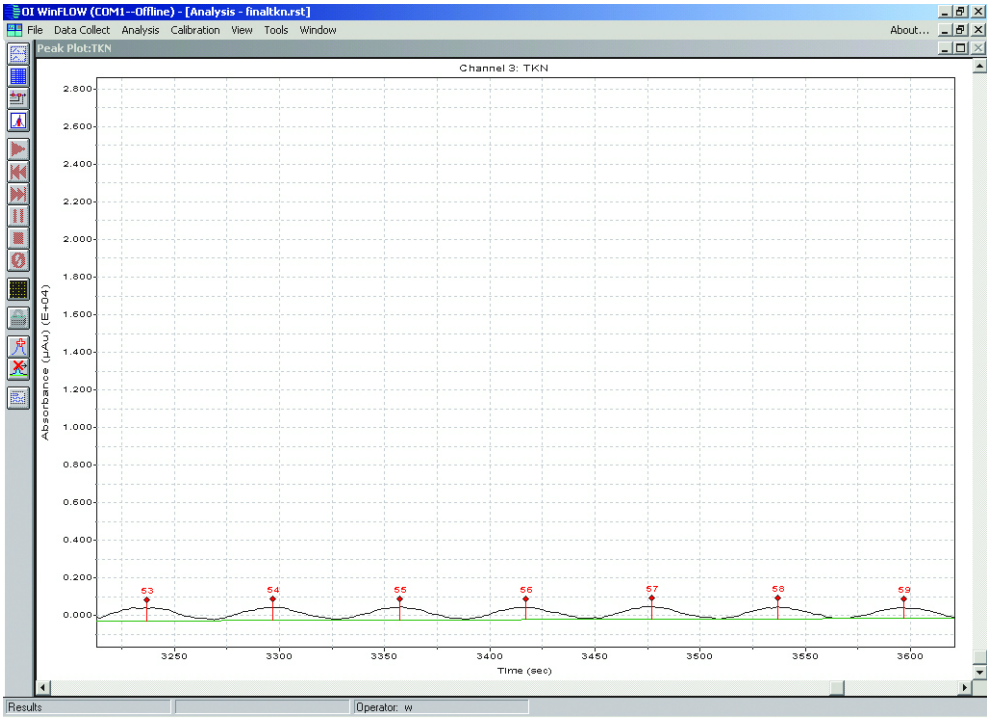



Figure 3. TKN MDL (at 0.01 ppm)

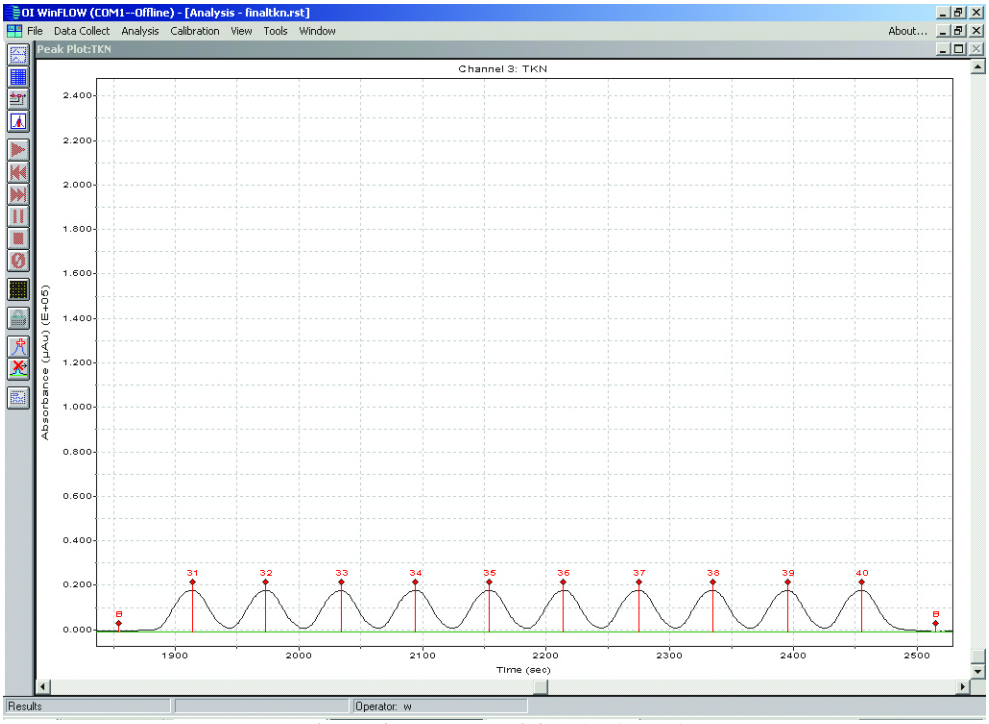



Figure 4. TKN Precision (at 1 ppm)

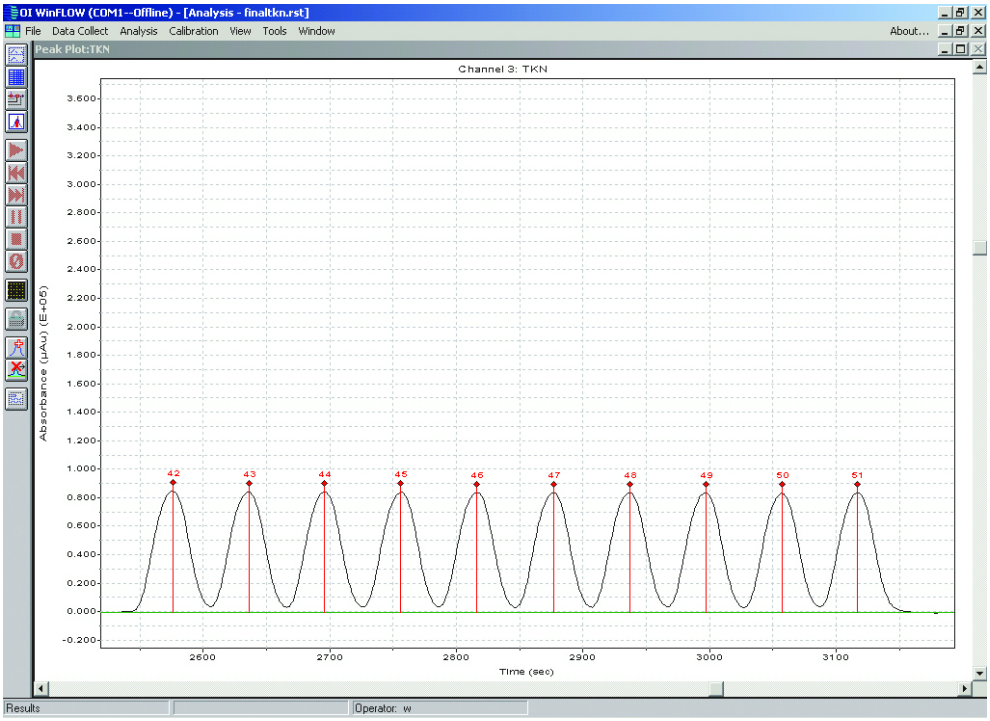



Figure 5. TKN Precision (at 5 ppm)

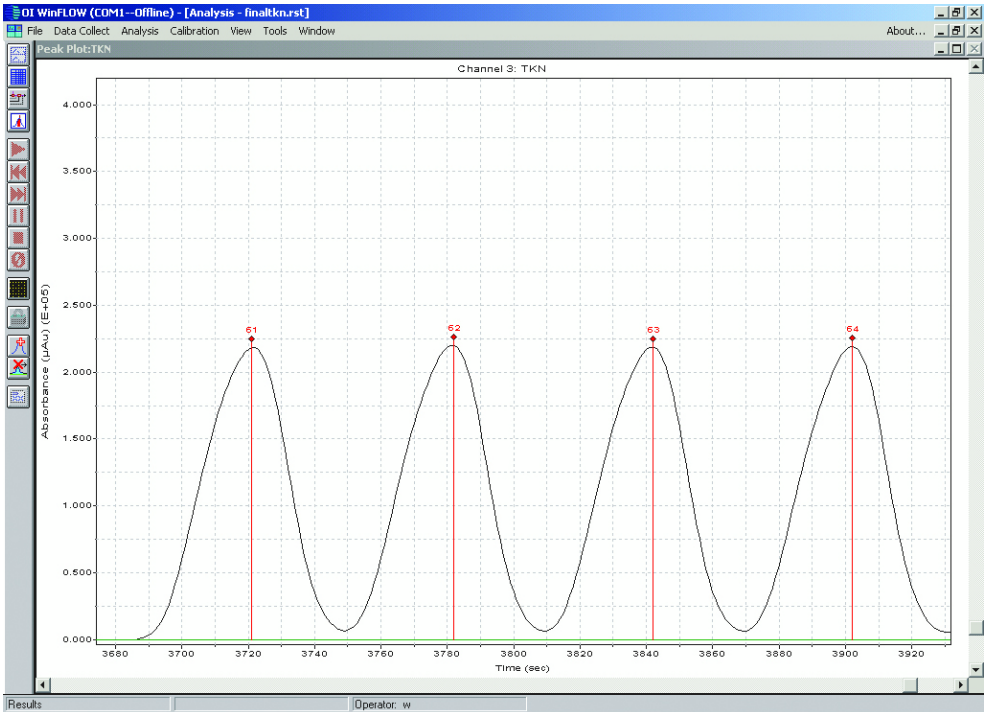



Figure 6. TKN IDAC QC Samples

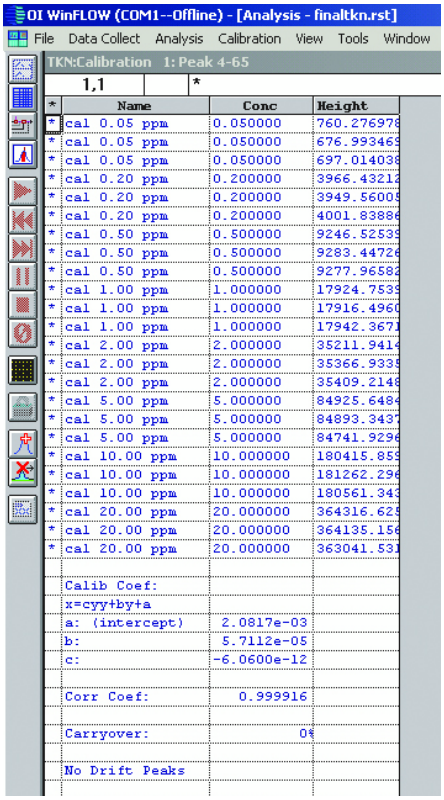



Figure 7. TKN Calibration Results (0.05–20 ppm)

Table 1. Total Kjeldahl Nitrogen Precision Calculations

| | 1.00 mg N/L | 5.00 mg N/L | 0.10 mg N/L | ERA P127-739B |
|---|---|---|---|---|
| **Rep 1** | 0.985 | 4.76 | 0.118 | 12.9 |
| **Rep 2** | 0.978 | 4.74 | 0.132 | 12.8 |
| **Rep 3** | 0.974 | 4.73 | 0.116 | 12.8 |
| **Rep 4** | 0.969 | 4.74 | 0.116 | 12.8 |
| **Rep 5** | 0.974 | 4.73 | 0.116 | — |
| **Rep 6** | 0.972 | 4.74 | 0.116 | — |
| **Rep 7** | 0.968 | 4.73 | 0.114 | — |
| **Rep 8** | 0.978 | 4.73 | — | — |
| **Rep 9** | 0.975 | 4.74 | — | — |
| **Rep 10** | 0.971 | 4.70 | — | — |
| **Mean** | 0.974 | 4.73 | 0.118 | 12.8 |
| **Standard Deviation** | 0.0005016 | 0.014789 | 0.006157 | 0.035151 |
| **% RSD** | 0.51 | 0.31 | 5.20 | 0.27 |
| **% Recovery** | 97 | 95 | 118 | 98 |
| **MDL** | — | — | 0.019 | — |

ERA sample recovery on non-digested, simple nutrient Ready-to-Use Quality Control Sample.



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