**Total Nitrogen/Total Carbon by Dry Combustion Method Summary**

**1. Principle –** This method describes the determination of total N and/or total C in soil, sediments, plant, or biologic material by flash combustion. Complete combustion of the sample is achieved by dropping a known mass of sample into a combustion tube containing Cr (III) Oxide and Cobaltous/ic Oxide Silver catalysts. A stream of purified oxygen is added to the quartz tube generating a flash combustion reaction which increases the temperature from 1020°C to 1800-2000°C. The flash combusted samples’ carbon is converted to C02 and the nitrogen is converted to N2 and NOx. These combustion gases are carried via a stream of UHP Helium through a reduction furnace filled with reduced copper wires where NOx is reduced to N2. Depending on the analysis requested, the gas stream now passes through either one or two sorbent traps to remove water (Magnesium Chloride) and, if only N2 is being determined, CO2 (Carbosorb Granular). The resulting N2 gas and/or CO2 gas is separated on a 2m x 6mm OD stainless steel Porapak QS 80/100 mesh packed chromatographic column and detected quantitatively by a Thermal Conductivity Detector.

# 2. Instrument Used: Costech Model EA 4010 Elemental Analyzer. Costech International Strumatzione, Florence, Italy, 2003.

**3. References:**

**3.1** Official Methods of Analysis of AOAC International, 17th Edition (2000), AOAC International, Arlington, VA. Method 972.43, Micro-chemical Determination of Carbon, Hydrogen, and Nitrogen, Automated Method.

**3.2** Methods of Soil Analysis, Part 3 – Chemical Methods, Soil Science Society of America Book Series #5, Soil Science Society of America, Inc., Madison, Wisconsin. Dumas Methods, Determination of Total Nitrogen and Total Carbon by Combustion.

**3.3** ECS 4010 Elemental Combustion System CHNS-O Operating Manual, Costech Analytical Technologies Inc., Valencia, CA.

4. **Standards Used**:

**4.1 Calibration Standards:** Acetanilide (CH3CONHC6H5), ACROS, 99+%. Acetanilide theoretical value of 71.09 weight percent C and 10.36 weight percent N is used for a five-point calibration.

**4.2 Continuing Calibration Verification (CCV):** A known mass of the calibration standard (acetanilide) is analyzed. Recovery must fall within the following acceptance limits: Percent recovery should be between 95% - 105% of theoretical value.

**4.3 External Reference Standards**: Atropine is purchased from Costech and used as the external reference standard. A known mass of this standard is analyzed and the recovery is calculated based on the known value of 70.56 weight percent C and 4.84 weight percent N.