**Notice of Intent to Sole Source #SSN-2022-068-AH**

**Organic Elemental Analyzer**

The Department of Soil and Crop Sciences at Colorado State University (CSU) intends to purchase an elemental analyzer as a sole source procurement from Elementar Americas, Inc. The analyzer will be installed in the Soil, Water and Plant Testing Laboratory (SWPTL) at the CSU SPUR Campus. The components described herein have been determined to be the only products that will meet the requirements of the department.

Listed within is the specific rationale for purchasing this equipment. No substitutions for brand and model will be accepted as responses to this SSN.

Responses must be submitted electronically via the Rocky Mountain E-Purchasing System (RMEPS, located at https://www.bidnetdirect.com/Colorado) no later than 12:00 PM MT, May 5, 2022. Interested vendors MAY NOT directly contact the department regarding this procurement. Inquiries must be directed to the Purchasing Agent, Alta Herndon, at Alta.Herndon@Colostate.edu.

**Note:** The terms *specifications*, *features*, and *requirements* are used interchangeably in this document to describe essential attributes of the equipment unless otherwise stated.

RESPONSES TO THIS PROPOSED SOLE SOURCE MUST INCLUDE THE FOLLOWING:

1. Provide a point-by-point response to the specifications/requirements as outlined in the corresponding sections within this document. This would include, but not be limited to, a narrative for each specification, documentation to certify and validate vendor specifications, brochures or binders containing vendor specifications which can be evaluated by Colorado State University personnel, and any other pertinent information concerning the vendor's equipment/components. Detailed information is requested, and vendor must list brand, model and part numbers for each item. Vendors responding will be required to provide proof of their capabilities (scientific data, historical evidence, customer references) to provide this equipment.
2. Vendor responses must be formatted as outlined, followed by a point-by-point discussion of each specification and how their proposed equipment solution will satisfy the specification.
3. Specifications must meet or exceed the specifications provided in this Proposed Sole Source.
4. Colorado State University will be the sole judge of equivalence.
5. All questions pertaining to this request must be submitted by email to alta.herndon@ColoState.edu. Please reference SSN-2022-068-AH in the subject line of the email.
6. Failure to respond as instructed will result in disqualification.
7. Any purchase order resulting from this Proposed Sole Source will be governed by the Colorado State University Purchase Order Terms and Conditions, available as a separate document with the bid packet posted on https://www.bidnetdirect.com/Colorado.

## Introduction and Description of Business Need

Research programs within the Department of Soil and Crop Sciences at CSU reflect the concerns of the people of Colorado associated with food production and the growth and utilization of feed and forage for livestock. The programs consider the most efficient use of Colorado's limited land and water resources and are directed toward the maintenance of high-quality agricultural, residential, industrial, and natural environments. To meet the broad-based requirements of these objectives, much of the department's research involves cooperation with other segments of the University, as well as with other state, federal and private agencies.

Soil and Crop Sciences researchers study soil organic matter dynamics and need to measure the total carbon, nitrogen, and sulfur in all of their soil samples and soil fractions as a basic analysis for the work being done. To measure the total C, N and S in soil samples, an elemental analyzer is required.

The Soil, Water and Plant Testing Laboratory (SWPTL) does not currently have an instrument that measures C, N and S and currently uses the equipment in the EcoCore Analytical Services that is located on the Fort Collins, CO campus. After the SWPTL is relocated from the Fort Collins, CO campus to its new facility at the CSU SPUR Campus in Denver, CO, it will no longer be cost-effective to continue using the equipment at the EcoCore Analytical Services.

The elemental analyzer required by SWPTL must allow for immediate sample introduction into the instrument for immediate sample analysis without having to run several calibration samples to condition the instrument before experimental samples can be analyzed. The analyzer must be capable of complete sample combustion and detection of nitrogen (N2), carbon dioxide (CO2), and sulfur dioxide (SO2) gases. Direct measurement of these gases without dilution provides precise data for reporting carbon, nitrogen and sulfur values.

Researchers investigated elemental analyzers currently available in the marketplace and found that with one exception, the products did not meet their requirements. The instrument identified as capable of meeting all of the SWPTL requirements is Elementar's vario EL cube CNS.

RATIONALE FOR PRODUCT CHOICE

In the course of researching multiple instruments, the following shortcomings were identified:

- Except for the vario EL cube, none of the analyzers offered temperature program desorption (TPD) columns, which allow to achieve complete seperation of individual elements regardless of element concentration within the sample.
- Other intruments do not offer Sulfur analysis.
- Running calibration samples is required on other analyzers before experimental samples can be analyzed. The EL cube utilizes a patented ball valve technology that eliminates the need to run calibration samples.
- Reducing agents in other instruments reviewed must be changed every 100-200 samples, while the EL cube only requires changing reducing agents every 1000-2000 samples.
- Some of the reviewed instruments do not have a post combustion tube which can result in excess methane, generated from incomplete combustion, returning inaccurate Nitrogen results. The EL cube has a post combustion tube that removes excess methane and delivers more precise Nitrogen data.

- Other instruments lacked sufficient autosampler positions, with the standard being a 30 position autosampler; additional plates must be purchased for added sample capacity. The EL comes standard with a 80 position autosampler.
- Overall dimensions of most other instruments are larger than that of the EL cube, with the EL cube taking up the least amount of lab benchtop space
- Compared to the EL cube, other instruments use higher amounts of both carrier and combustion gases.
- Instruments reviewed use a ballast tank to collect combusted gases, and once collected, the instrument takes an aliquot of the gas and passes the sample through traps and scrubbers before it reached to TCD. The EL cube does not use ballast tanks as they are more difficult to clean and maintain, which limits instrument use.

Upon concluding its investigation, the department has determined that the Elementar vario EL cube CNS described herein best meets its requirements.

## Required Specifications/Requirements

### A. Elemental Analyzer (EA) Specifications & Requirements:

1. High-temperature combustion unit: complete sample digestion at up to 1,200°C (or 1,800°C at the point of combustion when tin foil is used).
2. Purge and trap chromatography: separation of gaseous components for up to three gas-selective columns.
3. Thermal conductivity detector.
4. Sample introduction:
    i. Integrated 60, 80, or 120 positions autosampler for solids and liquids in capsules, reloadable during analysis.
    ii. Integrated 2 ml vial, 50 positions liquid autosampler with rinse and waste vial, reloadable during analysis.
5. Largest weighing range: from 20 µg to 1 g soil.
6. Largest dynamic range of element concentrations and rations:
    i. C: up to 20 mg abs.
    ii. N: up to 15 mg abs.
    iii. S: up to 3 mg abs.
    iv. O: up to 6 mg abs.
    v. H: up to 3 mg abs.
7. Elemental performance (external precision, 1σ): <0.1% for C, N, S and O
8. Isotope ratio performance (external precision, 1σ):
    i. $\delta^{13}C$: 0.1 0/00
    ii. $\delta^{15}N$: 0.15 0/00

iii. $\delta^{34}S$: 0.2 0/00

iv. $\delta^{18}O$: 0.3 0/00

v. $\delta^{2}H$: 3 0/100

vi. $\delta^{2}H$ (HDChrome): 0.5 0/00

**9.** Analysis time: ~3 – 4 min per element, self optimizing according to element content and sample weight.

**10.** Instrument Control: Windows™-based lyticOS™ software suite with LIMS integration and auto sleep/wake-up function for automated and unattended overnight operation.

**11.** Required gases: Helium and oxygen.

**B.** Additional Requirements:

1. Online training for a minimum of one person is required for each of the following:
   i. Software training for analyzing samples, processing results and evaluating data.
   ii. Sample preparation for analysis.
   iii. Assess system readiness.
   iv. Basic principles of analysis and analyzer function.
   v. Select appropriate sample size and analysis method.
   vi. Perform routine maintenance to prevent maintenance-related issues.
   vii. Troubleshoot routine problems including leaks, blockages and exhausted chemicals.

## Summary

Our investigation indicates that the vario EL cube CNS elemental analyzer from Elementar Americas Inc. is the only instrument currently available that best meets all the requirements as determined by the Department of Soil and Crop Sciences' SWPTL.