



Form GSOP 1-PIN (04/98)

STATE OF CALIFORNIA
Department of General Services - Office of Procurement

PURCHASE ORDER

Table with Purchase Order No. 62148, Rev. 6/30/2008, and columns for Supplier No., Solicitation No., Delivery Date, FOB Point, and Invoice Terms.

Main form containing supplier information (ALL BUSINESS MACHINES, INC.), agency information (DEPT OF PUBLIC HEALTH), and administrative details like Agency Billing, Agency Purchase Estimate, and Agency Contact.

Table with columns: Item No., Quantity, Unit, Commodity Code, Description, Unit Price, Extension. Contains detailed description of the purchase item and a total value of 156,821.84.

Buyer information section with signature of Evonne Rogers, phone number 916-375-4346, and BOC Number field.

Sales and/or use tax to be extra unless noted above

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**PURCHASE ORDER CONTINUATION**

Form GSOP 2-PIN (04/98)

<i>Purchase Order No.</i> 62148	<i>Revision</i>	<i>Date</i> 6/30/2008	<i>Supplier No.</i> 755028	<i>Supplier Name</i> ALL BUSINESS MACHINES,INC.
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<i>Item No.</i>	<i>Quantity</i>	<i>Unit</i>	<i>Commodity Code</i>	<i>Description</i>	<i>Unit Price</i>	<i>Extension</i>
<p>to this purchase order shall be construed to have been made on the last day of the preceding fiscal year.</p> <p>CHANGE ORDERS:</p> <p>This Purchase Order may be amended, modified or terminated at any time by mutual agreement of the parties in writing. Change orders amending, modifying or terminating the Purchase Order, including any modifications of the compensation payable, may be issued only by the State Procurement Officer. All such change orders shall be in writing and issued only upon written concurrence of the supplier. Termination, as that term is used in this section, does not include termination for default of the supplier.</p>						



**1 SCOPE**

This specification establishes the requirements for a bench-top, Inductively Coupled Plasma Mass Spectrometer (ICP/MS) used by the California Department of Public Health to analyze trace elements in biological specimens (Biomonitoring).

**2 APPLICABLE SPECIFICATIONS**

Specifications and standards referenced in this document in effect on the opening of the Invitation for Bid form a part of this specification.

**3 REQUIREMENTS**

3.1 The ICP/MS shall be a fully integrated, computer-controlled system that shall include the following hardware and software components:

- 3.1.1 All equipment necessary to generate, maintain and monitor the high vacuum environment required for the mass spectrometer.
- 3.1.2 Inductively coupled argon plasma source including solid-state RF generator.
- 3.1.3 Mass spectrometer interface with nickel sampler and skimmer cones.
- 3.1.4 Mass spectrometer with ion focusing system, quadrupole mass analyzer, and ion detector assembly.
- 3.1.5 Water chiller/recirculator.
- 3.1.6 Automated sampler with HEPA-filtered enclosure.
- 3.1.7 Sample introduction system including a multi-channel sample pump (3 channels minimum), nebulizer and Peltier-cooled spray chamber.
- 3.1.8 HPLC speciation module - Arsenic speciation module shall integrate with instrument and software, and shall include at minimum: Autosampler, pump, column compartment with thermostat, separation column and guard column.
- 3.1.9 6-Port injection valve accessory with fixed volume sample loop, rinsing of autosampler probe during sample measurement phase and very short distance between injection valve and nebulizer, in order to provide rapid sample analysis and decreased instrument exposure to sample matrix.
- 3.1.10 Interference reduction system (IRS) based on collision and/or reaction technology to minimize or eliminate polyatomic interferences; regulators for collision or reaction gases shall be provided with the instrument.
- 3.1.11 Standard tool kit and special tools needed for maintenance and minor repairs.
- 3.1.12 The ICP-MS instrument shall be a bench-top model (not floor-standing).
- 3.1.13 Computer work station compatible with the ICP-MS system operation; complete with 19" or larger LCD flat panel display, laser printer and all required cables.

- 3.1.14 The ICP-MS software shall operate under Windows XP ® and shall be capable of generating analytical reports, including all relevant data, in one or more of the following formats for transfer to a Laboratory Information Management System (LIMS): Text, CSV or XLS.
- 3.1.15 The ICP-MS software shall feature fully automated system startup and shut down capability, real time displays to monitor system performance, tuning, internal diagnostics, and error checking. It shall be capable of storing tune parameters, including the plasma torch position, for future recall.
- 3.1.16 System optimization (autotuning) shall be under computer control and performed automatically by the software, as required. Computer controlled optimization shall include mass calibration, mass resolution, ion lens focusing, plasma gas flows, and torch position. The torch position must be adjustable under computer control in all three dimensions (x,y,z).
- 3.1.17 Software shall be included for the acquisition and analysis of time-resolved data resulting from speciation studies in which a chromatograph is used for sample introduction to the ICP-MS. The chromatography software must have the capability to smooth chromatographic signal traces, perform peak searches within signal traces, locate baselines, perform background subtraction, determine peak areas and peak heights, and establish calibrations curves using peak area or peak height results from chromatographic analyses of a series of standards. It shall be able to correct analyte signal traces using intensities measured for continuously introduced mass spectrometric internal standards.

## 3.2 SYSTEM PERFORMANCE:

### Sensitivity, Resolution, Dynamic Range, Stability

- 3.2.1 The system shall be capable of performing mass spectral analysis over the m/z range of 4 to 250, and determining concentrations of all major, minor and trace elements in the analysis solution. The latter requirement does not apply to hydrogen, oxygen, nitrogen, fluorine and chlorine.
- 3.2.2 The system shall be capable of routinely meeting, or exceeding, the performance criteria and detection limits specified in USEPA Method 200.8, Determination of Trace Elements in Waters and Wastes by Inductively Coupled Plasma-Mass Spectrometry, Rev. 5.4, 1994.
- 3.2.3 The system shall be capable of achieving a mass resolution of 0.7 amu at 10% of peak height.
- 3.2.4 The system shall be capable of providing a linear dynamic range of analysis of nine (9) orders of magnitude, extending from 1 ppt to 1000 ppm for indium. The deviation from linearity shall be no more than 10% in the range 100 ppt to 1 ppm.
- 3.2.5 The abundance sensitivity shall be adjustable to better than  $10^{-7}$  at 1 amu higher and to  $10^{-6}$  at 1 amu lower than the mass of interest.
- 3.2.6 The ICP-MS system shall be capable of routinely achieving or exceeding the following sensitivity levels: 5000 cps/ppb for  $^7\text{Li}$ , 40,000 cps/ppb for  $^{115}\text{In}$ , and

20,000 cps/ppb for  $^{238}\text{U}$ . This shall be demonstrable using a single test solution, a single set of measurement conditions, and a standard sample introduction system with pneumatic nebulization.

- 3.2.7 Under routine operating conditions, the peak intensity of a multi-charged ion shall not exceed 3% of the peak intensity of the corresponding singly charged ion for all elements, including Ba. Under the same operating conditions, the  $\text{CeO}^+/\text{Ce}^+$  peak intensity ratio shall not exceed 3%.
- 3.2.8 Random background shall be less than 10 cps at mass 220.
- 3.2.9 Mass calibration stability shall be better than 0.05 amu during an 8 hour time period, and better than 0.10 amu over a one month period.
- 3.2.10 The system shall be capable of achieving an isotope ratio precision of better than 0.2% for  $^{107}\text{Ag}/^{109}\text{Ag}$ , in a 2 min total acquisition time with a solution containing 10 ppb of silver.
- 3.2.11 Under routine operating conditions, the coefficient of variation for 10 consecutive, 3-second acquisitions for 10  $\mu\text{g/L}$  of Mg, Cu, Cd, and Pb shall be better than 4%.
- 3.2.12 Under routine conditions, and excluding elements associated with the plasma or water, the signal level for all non-volatile elements shall be less than 0.1% of the original level after a 60 second washout time with a 1% nitric acid solution. For mercury, the signal level shall be less than 0.5% of the original level after a 60 second washout time.
- 3.2.13 Contribution of nickel from sampler/skimmer cones constructed from nickel shall be low enough such that a 100 ng/L detection limit is achievable for nickel.

#### Data Acquisition and Analysis

- 3.2.14 The ICP-MS data acquisition system shall be capable of recording intensity readings at any given m/z value with a dwell time of 200 microseconds or less.
- 3.2.15 The achievable mass spectrometer scan speed shall be 2000 amu per second or greater.
- 3.2.16 The following modes of data acquisition shall be available:
- Scanning (spectrum) mode
  - Selected ion monitoring (peak jumping) mode
  - Chromatography mode (time-resolved analysis)
- 3.2.17 The following modes of data analysis shall be available:
- Quantitative analysis with external calibration (normal mode)
  - Quantitation by standard addition
  - Semi-quantitative analysis mode: Samples may be screened for all elements analyzable by ICP-MS without the need to calibrate for all elements measured
  - Isotopic Analysis Mode (used with isotope ratio and isotope dilution measurements)

Interference Reduction System (IRS)

- 3.2.18 The IRS shall provide for the simultaneous connection of a minimum of two collision/reaction gases.
- 3.2.19 Flow rates of all collision/reaction gases shall be under full software control.
- 3.2.20 The system shall provide sample analysis with or without the use of the IRS.
- 3.2.21 Use of the IRS shall not create new ion species that can interfere in the analysis of any element normally analyzable without the use of the IRS.
- 3.2.22 The IRS shall be able to remove argon-based and other interferences without resorting to cool or cold-plasma conditions.
- 3.2.23 Specifically, the IRS must be capable of removing the following interferences:
- ArAr on  $^{78}\text{Se}$  and  $^{80}\text{Se}$
  - ArO on  $^{56}\text{Fe}$
  - ArC on  $^{52}\text{Cr}$
  - ArCl on  $^{75}\text{As}$
  - ClO on  $^{51}\text{V}$  and  $^{53}\text{Cr}$
  - ArNa on  $^{63}\text{Cu}$
  - CaO on  $^{60}\text{Ni}$
  - MoO on  $^{111}\text{Cd}$
- 3.2.24 The following detection limits shall be routinely achievable when using the IRS and when the ICP-MS is operated in an environment that does not result in significantly elevated blank levels:
- 10 ng/L for  $^{78}\text{Se}$  or  $^{80}\text{Se}$ ,
  - 50 ng/L for  $^{56}\text{Fe}$ .
- 3.2.25 When analyzing a solution containing 1 ppb of arsenic in a 1% HCl matrix, the instrument and IRS shall be capable of producing a result in the range  $1.0 \pm 0.1$  ppb without resorting to interference correction equations or using matrix-matched standards.
- 3.2.26 When analyzing a solution containing 1 ppb of vanadium and 1 ppb of chromium in a 1% HCl matrix, the instrument and IRS shall be capable of producing results in the range  $1.0 \pm 0.1$  ppb for  $^{51}\text{V}$  and  $^{53}\text{Cr}$  without resorting to interference correction equations or using matrix-matched standards.
- 3.2.27 When analyzing a solution containing 1 ppb of chromium in the presence of 200 ppm of non-volatile carbon, the instrument and IRS shall be capable of producing a result in the range  $1.0 \pm 0.1$  ppb for  $^{52}\text{Cr}$  without resorting to interference correction equations or using matrix-matched standards.

### HPLC Speciation Module

- 3.2.28 Vendor to demonstrate an LC or IC chromatographic application where Arsenobetaine is separated from all other common toxic forms of arsenic with the Arsenic-(5) eluting in less than 12 minutes using isocratic conditions on the LC/IC.
- 3.2.29 Chromatographic software shall have the ability to incorporate on-line internal standard for continuous point to point compensation across the whole chromatogram in order to compensate for any signal drift that might occur for any LC or IC applications requiring the use of concentrated buffers in the mobile phase.
- 3.2.30 Chromatographic software shall provide user-friendly utilities that retrieve and export all chromatographic data to spreadsheet applications or databases. This data shall include peak names, quant masses, retention times, peak areas, peak amounts, and integration start/stop times.
- 3.2.31 Chromatographic software shall provide the user with an easy, graphical user interface which allows resetting of retention times and start/stop integration points.
- 3.3 SAFETY CONSIDERATIONS:
- 3.3.1 The RF generator design shall meet all FCC certification requirements for RF emission.
- 3.3.2 The operator must never be exposed to unshielded RF or stray UV emissions.
- 3.3.3 All plasma support gases shall be supported by safety interlocks.
- 3.3.4 The system shall automatically shut down and stay down in the event of electrical power failure, loss of argon pressure or flows, loss of vacuum, loss of cooling water, overheating, or exceeding normal operating limits, until the system is restored and brought up by the operator.
- 3.4 The following items shall be available as options:
- Platinum-tipped cones to replace the standard nickel sampler and skimmer cones
  - A hydrofluoric acid (HF) resistant sample introduction system
  - A continuous-flow hydride generation system



**1 BIDDER QUALIFICATION**

The bidder shall be either the manufacturer or authorized distributor/representative and be able to demonstrate a history (minimum 2 years and 10 customers) in the manufacturing or distributing of ICP-Mass Spectrometers.

**2 STANDARD COMMERCIAL PRODUCT**

The System offered shall be in accordance with the requirements of Bid Specification 6630-0036. Features or components which are not specifically prohibited by this specification but which are a part of the manufacturer's standard commercial product or normally supplied, shall be included in the equipment being furnished. A standard commercial product is a product previously sold or is being currently offered for sale on the commercial market through advertisements or manufacturer's catalogs, or brochures, and represents the latest production model. The system shall meet OSHA safety requirements for the workplace.

**3 PRE-AWARD SYSTEM DEMONSTRATION**

The State reserves the right to request a system demonstration. If requested, the bidder shall arrange one in California within 15 days of notification.

**4 INSTALLATION**

- 4.1 All installation costs shall be included in the bid price.
- 4.2 Site preparation manuals/ instructions shall be provided prior to installation and shall include items such as operating environment (e.g. temp, humidity, etc.), power requirements, space requirements, and site preparation details.
- 4.3 Installation shall not occur until the complete ICP-MS system is delivered, including all software, peripherals and accessories.
- 4.4 Supplier shall provide on-site certified field representative(s) to install hardware and software.
- 4.5 Supplier shall unpack, install equipment and dispose/remove packing material from the premises.
- 4.6 Supplier shall conduct any calibration and installation tests required to ensure that the system is fully operational and capable of meeting specifications.

**5 OPERATION AND MAINTENANCE MANUALS**

- 5.1 A copy of the operating and service manual shall be furnished at the time of delivery. If there are any special tools required for normal operation, one set shall be provided.

**6 TRAINING**

- 6.1 The purchase price shall include at least 2 days of onsite training for two operators.

**7 WARRANTY**

- 7.1 The system shall be fully warranted to be free from defects in materials and workmanship for a minimum period of 1 year from date of acceptance, or for the manufacturer's standard warranty term, if longer. The warranty shall include all parts and labor incurred by the contractor to maintain the system in new condition.