**Section 1 Specification**

**Ref: NLS160801**

**Title: Supply of a Gas Chromatograph - Mass Spectrometer System**

**Part A Technical Specification**

1. **General**

The NLS Nottingham Laboratory (Meadow Lane Nottingham, Meadow Lane, Nottingham, NG2 3HN) has a requirement for an automated Gas Chromatograph with Mass Spectrometric detector. The equipment shall comprise of a heated Gas Chromatograph oven with injector port, a mass spectrometric detector and an auto-sampler. All aspects of the equipment must conform to the requirements of Good Laboratory Practice (GLP), Good Automated Laboratory Practice (GALP) and meet the requirements of the international standard BS EN ISO/IEC 17025:2000 (General requirements for the competence of testing and calibration laboratories).

1. **The System** - **Gas Chromatograph/Mass Spectrometer (GCMS)**

The equipment will be used primarily for the analysis of Di-2-(ethylhexyl) phthalate (DEHP) in fresh and saline water, treated and untreated sewage, landfill and prepared leachate, and trade to controlled waters. The system must be capable of achieving the detection limits\* listed in Table 1. The detection limit\* must be achievable according to the NLS definition for performance testing based on NS30.

*“…The Limit of Detection (LoD) is calculated using the definition given in NS30 (Manual on Analytical Quality Control for the Water Industry, R.V.Cheeseman & A.L. Wilson, revised by M.J.Gardner WRc 1989, ISBN 0 902156 85 3) and is based on the concept of an adequately low risk of failure to detect the determinand.*

*It is calculated using the equation:  LoD = 2√2.t.sw where Sw is the within batch standard deviation blank results. t is the student's t statistic for the number of degrees of freedom assigned to the standard deviation*

The equipment will be used for analysing a range of liquid matricesfor the compounds listed in Table 1 to the Detection Limit Stated (based on the extraction of 1 litre aqueous sample to 1 ml of an appropriate carrier solvent)

The space available requires the equipment to be compact in design and capable of bench-top installation where the depth should not exceed 75 cm.

Table 1.

|  |  |
| --- | --- |
| Analyte | Detection Limit (microgram / litre) |
| Di-2-(ethylhexyl)phthalate (DEHP) | 0.2 |

1. **COMPONENTS OF THE SYSTEM**
   1. **Injection Port System**

The system should be fitted with a PTV inlet with Split / Split-less capabilities**.**

The port system must be temperature programmable (at least two ramps) with injection volumes of up to at least 50µl (single injection) or 500ul (multiple injection)

The system must offer injection flexibility. Techniques such as split, split-less, solvent venting, on-column and pulsed split-less should be available and any combination of two available on one instrument.

All system parameters to be stored with the main instruments' method file. Interface kits where necessary must be provided and included in the cost.

Set up and optimisation of the injector port must be possible in the normal operating mode of the main instrument.

Temperature range of near ambient to 4000C, or greater with additional sub-ambient cooling to at least -500C using C02 (1) or N2 (1) must be included.

The port must be fully compatible with the Gas Chromatograph (GC) auto-injector system and its mountings, to enable unattended operation.

Compatibility with the manual and electronic pressure control systems of the GC is essential.

The system should have a purge gas saver to minimise gas consumption.

* 1. **Gas Chromatograph**

A high performance fully automated capillary Gas Chromatograph accepting a wide range (0.1 to 0.53mm id) of columns and capable of performing large numbers of routine analyses is required, with the following features:

Temperature programmable oven up to 4500C with a minimum of four ramps

Heating cooling rates should be specified as faster GC cycle times will result in more efficient run times

Fitted with makeup gas controls, capable of being set electronically, to provide optimum performance.

Fitted with a high efficiency, heated, inlet capillary interface to suit the mass spectrometer.

Fitted with appropriate injection turret with the capability to use variable syringe sizes.

* 1. **Auto-sampler**

The instrument must be fitted with an auto-sampler which is fully compatible (but not necessarily integrated) with the GC injection system and which meets the following requirements:

Minimum capacity 100 sample vials, excluding wash vials.

Random access capability.

Automated sampling.

Easily removable from the system for maintenance etc.

Programmable operation via the mainsystem computer, using integrated, compatible software.

* 1. **Mass Spectrometer**

A bench-top single quadruple mass spectrometer, interfaced to the Gas Chromatograph is required, which must meet the following requirements:

Mass detector operating in both Negative and Positive Chemical Ionisation (NCI) mode.

GC interface temperature up to 350oC.

Unit mass resolution, over a minimum range of 10-1000 amu, with variable scan speeds over the entire mass range.

Scan rate up to 5000 amu/sec.

Low noise detector with a wide dynamic range (> 106 ) and linearity of at least four orders of magnitude.

The MS must be capable of operating in either scan or selective ion monitoring mode.

Menu driven venting and pump-down of mass detector. The design must be of a fail-safe nature, to prevent instrument damage in the event of a power failure. The mass detector should be independent of data/instrument controller failure.

Easy dismantling, cleaning, reassembly of source components. Details must be provided for typical source cleaning and filament replacement times (under normal operating conditions), to include pumping down to operational vacuum.

Ion source type should be inert and have a temperature range of 150 – 350˚C.

Ionisation Energy should range from 5 – 200 Ev.

Quadrupole temperature should range from 100 - 200˚C

Automatic tuning and calibration facility, allowing automatic optimisation of sensitivity to current determinants.

Low-maintenance, high capacity turbo molecular vacuum pump system to ensure uncontaminated background spectra. Particularly when dealing with water vapour. Ideally the pump should be of low energy consumption.

1. **Software, Data Handling and Control**

The instrument must be provided with the appropriate computer hardware and software, fully programmed for operation. No user programming will be acceptable (other than setting up methods). All software provided must be user friendly.

The system provided must meet the following criteria:-

The computer must be at least Intel I5 processor or equivalent, with a minimum of 8 GB RAM, 500 GB hard disk, CD-RW/DVD ROM Drive, 24" LCD colour monitor, instrument interface board. Must have full power management facilities to save energy when not in use.

Standard software to be pre-loaded onto the computer must include Microsoft Windows 7 sp1 and Microsoft Excel 2014 (or most recent version) in addition to the instrument operating software and any other software required for normal operation. Exact operating requirements may vary, clarification must be obtained with local manager.

Full multitasking software, giving full control of the gas chromatograph, mass spectrometer, injection port and auto-sampler. Facilities must be provided for full data acquisition, storage and manipulation. This must include editing of analytical and data processing during real time, to enable fast set-up of retention times and integration parameters. Simultaneous examination and reprocessing of previous run data during collection of current run data must be available. The input of sample identifiers before, during or after a run must be possible or custom reporting facility available.

Acquisition data must be capable of macro, manipulation, such that customised set-up and integration of SIM chromatograms is possible.

Software must be capable of being customised by simple macro programming and provide full direct data exchange (DDE) communication with third party software (e.g. Microsoft Excel spreadsheet).

A stand-alone version of the software must be available.

A spectral de-convolution software must be provided.

Full quantification facilities must be provided, including multi point calibration (linear and quadratic with different weighting factors like equal, inverse of concentration, inverse of square of concentration etc ), peak height, peak area, peak ratios, internal & external standards and background subtraction. Details of the full facilities available must be specified.

Interface with a LAN (local area network) system and appropriate software with a minimum of 2 network cards.

1. **ADDITIONAL REQUIRED INFORMATION**

Please provide the following information with you quotation response

* Full information on the techniques and technology you intend to offer to comply with the performance requirements stated above.
* Full information on the service and maintenance options you can provide and their annual costs.
* Details of all instrument installation requirements including electrical and gas supplies and any exhaust extraction requirements
* Please provide an expected delivery time from receipt of order. Time will be of the essence in this purchase and prompt delivery as described in your response will be expected.
* Availability of technical advice for method development and application.
* Contact details of two organisations that have experience in using the proposed equipment. This information may be used by the NLS to seek references.

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**Part B: Special Conditions**

1. **Introduction :**
   1. The following conditions of contract relate to the installation of the equipment

and subsequent post-sales services and are supplementary to the standard conditions of contract for goods.

* 1. In addition to the interpretations listed in the standard conditions for Goods the following applies :-

1.2.1 “Acceptance Date” – means the date on which the Agency gives written notice of acceptance in accordance with Condition 5.

1.2.2 “Installation Site” – means the place where the Goods are to be installed in the Agency’s premises.

1. **Specification**
   1. The Goods shall be of the qualities and kinds described and equal in respects to the descriptions, specifications, patterns and Contractor's samples, which form part of the Contract or are otherwise relevant for the purpose of the Contract. Except in so far as may otherwise be indicated by such descriptions, specifications, patterns or Contractor's samples, the Goods shall be strictly in compliance with the latest relevant International or British Standards where such exist.
   2. All goods which customarily bear any mark, tab, brand, label or other device indicating place or origin, inspection by any Government or other body or standard of quality must be delivered with all the said marks, tabs, brands, labels or other devices intact.
2. **Packaging**
   1. The following details shall be shown with every delivery unless otherwise specified in the Contract:

Description of the Goods & quantity in package

Any special directions for storage/unpacking, which shall include the appropriate Health & Safety information

Expiry date of contents (where applicable)

Name of manufacturer and any other relevant information

* 1. The Contractor shall collect without charge any returnable containers (including pallets) within twenty-one days of the date of the relevant delivery note, unless otherwise instructed by the Agency named in the Contract. Empty containers not so removed may be returned by the Agency at the Contractor's expense or otherwise disposed of at the Agency's discretion. Charged containers shall be credited in full by the Contractor upon collection or return.
  2. All packaging shall be removed by the contractor and recycled/reused where possible. Disposal of waste must comply with all relevant legislation.

1. **Delivery and Installation**
   1. All equipment detailed herein must be delivered to designated site(s), installed and prepared for acceptance by the Agency on or before date specified.
   2. A delivery note clearly marked with the Agency’s order number shall accompany each delivery.
   3. The Goods shall be delivered free of charge to the Agency to the locations shown on the order and by the agreed delivery date. The Agency will make available access to the site as reasonably required by the supplier for the delivery and installation of the equipment.
2. **Tests and Acceptance**
   1. The following conditions supplement paragraph 12 (Rejection of Goods) of the Standard Conditions of Contract and identify that the acceptance of the instrument(s) need to satisfy the Agency’s nominated representative at post-commissioning stages.
   2. On completion of installation the supplier shall verify full operation of the system to demonstrate that the performance meets the requirements of the specification to the satisfaction of the Agency's nominated representative.
   3. The giving of the above notices by the Agency shall not in any way prejudice its rights if it is otherwise discovered later that the Goods do not meet the specification or otherwise fail to comply with the terms of the Contract.
3. **Price and Payment**
   1. The Contract Price shall be "net", that is, after deduction of all agreed discounts and fixed for the period of the contract. It shall include the cost of all royalties, licence fees, WEEE responsibilities, packaging, packing materials, addressing, labelling, loading, delivery to the addresses named in the Contract or orders, installation, commissioning and be in accordance with the amount set out in financial cost statement. All other costs, charges, fees and expenses of whatever kind for or arising out of or in connection with the provision of the Goods and Services shall be paid by the Contractor unless otherwise agreed in writing by the Agency
   2. Any early settlement or multiple purchase discounts shall be shown separately in the Contract.
   3. The payment details for the support and maintenance after the warranty period to be agreed
4. **Environmental Consideration**
   1. The following Conditions supplement paragraph 26 (Environment) of the Standard Conditions of Contract and are specific for Contractors supplying chemicals or any other hazardous goods or equipment where such products are used.
   2. The Contractor should ensure that all hazardous goods supplied to the Agency must be marked with the International Danger Symbol(s) and display the name of the material in English. All documentation must include a declaration of the hazard and the name of the material in English. Goods must be accompanied by emergency information in English in the form of written instructions, labels or markings. The Contractor shall ensure that all information held by, or reasonably available to him, regarding any potential hazard known, or believed to exist in the transport, handling or use of the Goods supplied is notified to the Agency.
   3. The Contractor shall notify the Agency of any Goods supplied for which there is a potential to cause environmental damage through their use and provide information to the Agency on the steps they are taking to minimise such damage.
   4. The Contractor shall ensure that he complies with all relevant legislation relating to the "Duty of Care and Registration of carriers" as detailed in the Environmental Protection Act 1990.
5. **Training and Operating Manuals**
   1. The Contractor shall supply free of charge installation drawings and manuals containing instructions for the use and maintenance of the Goods.
   2. The Supplier must provide full documentation and operational manuals (including software), for the operation and maintenance of the equipment.
6. **Maintenance and Spares**
   1. The Supplier must detail the routine operator maintenance required to keep the system performing to specification.
   2. The Environment Agency makes no commitment to purchase maintenance cover and/or consumables under this contract and reserves the right to source form other parties to ensure value for money is achieved and shall not in any way prejudice its rights under the agreed contract terms.