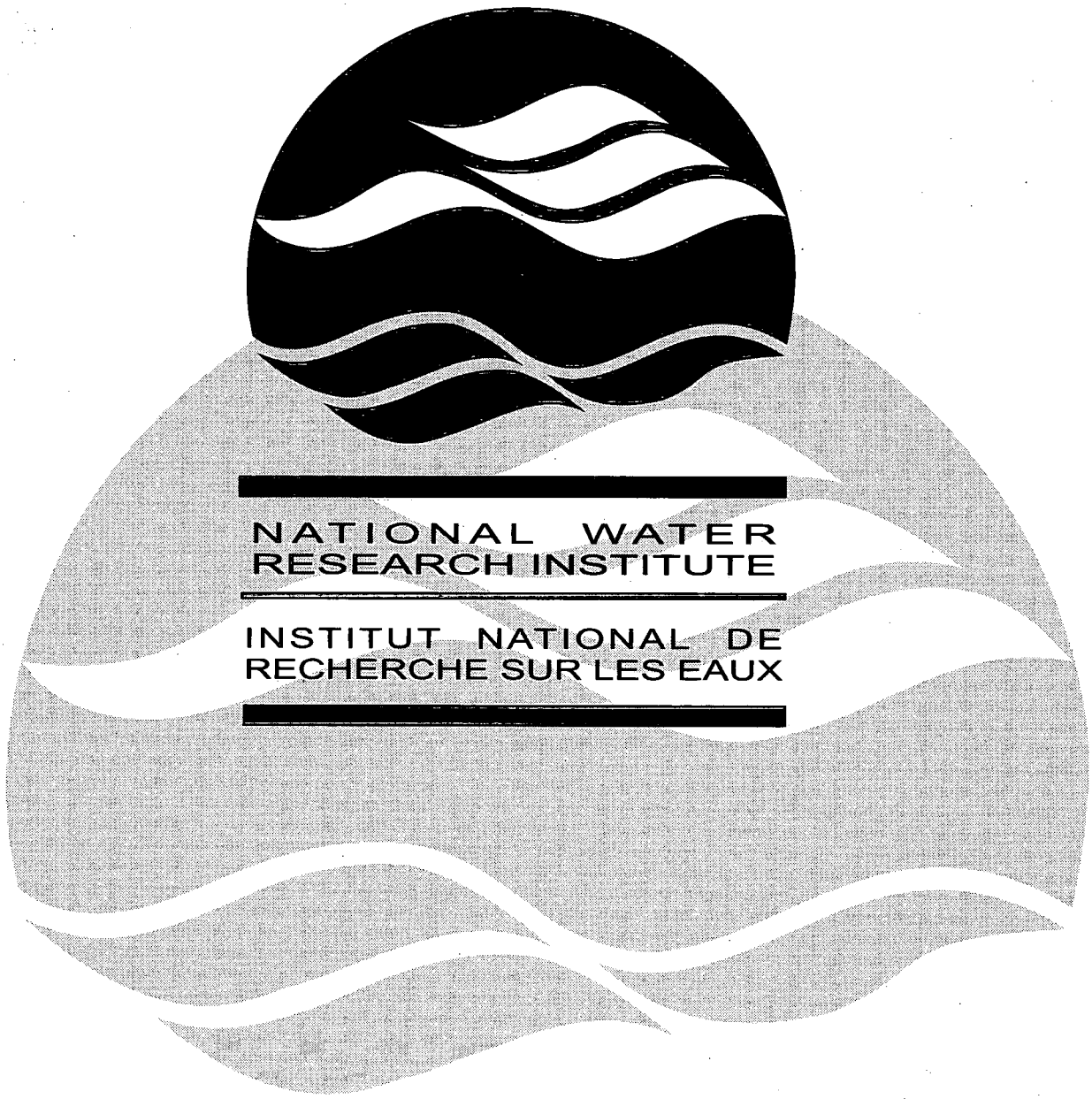

SUMMARY REPORT ON THE AVAILABILITY AND SUITABILITY OF EXTERNAL NATIONAL AND INTERNATIONAL QUALITY ASSURANCE PROGRAMS PERTINENT TO THE NORTHERN CONTAMINANTS PROGRAM

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NWRI Contribution No. 99-301

SUMMARY REPORT ON THE AVAILABILITY AND SUITABILITY OF EXTERNAL NATIONAL AND INTERNATIONAL QUALITY ASSURANCE PROGRAMS PERTINENT TO THE NORTHERN CONTAMINANTS PROGRAM

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MANAGEMENT PERSPECTIVE

This summary report details the results of a survey of national and international quality assurance (QA) providers, conducted in 1998-99 for the Northern Contaminants Program (NCP). The purpose of this survey was to identify external QA programs that would be complementary to, or could substitute for NCP coordinated interlaboratory studies. With this information, a more comprehensive QA program can be designed that will assist NCP science managers and northerners to make informed decisions regarding the sources of contaminants and their effects on the Arctic environment and on human health. In addition, it will ensure that the NCP's contributions to international agreements and controls to protect the health of the Arctic ecosystem and northerners are based on scientifically sound data.

The NCP Interlaboratory Quality Assurance (QA) Program, coordinated by Environment Canada, provides information on the quality, reliability and comparability of measurement results produced by laboratories generating data for NCP-funded research projects. The main activities of the NCP QA program are the intercomparison exercises, focusing on contaminants of concern to Canada's Northerners. The recommendations contained in this report will provide for the delivery of a more comprehensive and cost-effective QA program for the NCP. Participation by the NCP measurement laboratories in external QA programs not only adds value to the existing NCP QA program by addressing a much broader range of analytes and matrices, but also provides for an assessment of the comparability of NCP measurements to analytical data in other related international programs.

PERSPECTIVE DE LA DIRECTION

Ce rapport sommaire présente les résultats d'une enquête réalisée en 1998-1999 auprès de services nationaux et internationaux d'assurance de la qualité (AQ) pour le compte du Programme de lutte contre les contaminants dans le Nord (PLCN). L'objet de l'enquête était de recenser les programmes externes d'AQ qui seraient complémentaires aux études interlaboratoires coordonnées par le PLCN ou qui pourraient remplacer celles-ci. Cette information permettra de concevoir un programme plus complet d'AQ qui aidera les gestionnaires scientifiques et les populations du Nord à prendre des décisions éclairées concernant les sources de contaminants et leurs effets sur l'environnement arctique et sur la santé humaine. En outre, elle permettra de faire en sorte que les contributions du PLCN aux ententes et à la surveillance internationale visant à protéger la santé de l'écosystème arctique et des populations nordiques soient fondées sur des données scientifiques valables.

Le Programme interlaboratoires d'assurance de la qualité (AQ) du PLCN, qui est coordonné par Environnement Canada, fournit de l'information sur la qualité, la fiabilité et la comparabilité des résultats de mesures produits par les laboratoire qui fournissent des données pour les projets de recherche financés par le PLCN. Les principales activités du programme d'AQ du PLCN sont des exercices de comparaisons interlaboratoires portant sur les contaminants qui intéressent les populations du Nord canadien. Les recommandations contenues dans ce rapport permettront la mise en oeuvre d'un programme d'AQ plus global et efficace pour le PLCN. Non seulement la participation des laboratoires de mesure du PLCN aux programme d'AQ externes représente-t-elle une plus-value pour le programme d'AQ du PLCN parce qu'elle permet de couvrir une gamme beaucoup plus étendue d'analytes et de matrices, mais encore elle permet de déterminer la comparabilité des mesures du PLCN et des données d'analyse obtenues dans le cadre d'autres programmes internationaux.

ABSTRACT

This report summarizes the results of a survey conducted during 1998/99, that assesses the suitability of various national and international quality assurance (QA) programs for the Northern Contaminants Program (NCP). Each external QA program is evaluated in terms of target analytes, concentration levels, test sample matrices, cost, timing and frequency of the studies. In making recommendations on the use of these external programs to support the NCP's data quality needs, additional factors, such as the number of NCP-funded laboratories for which these external intercomparisons would be appropriate, are also considered. The pertinent intercomparison studies that are identified, will complement those run by the NCP QA program itself, and thereby allow for the delivery of a more cost-effective QA program that addresses a broader range of analytes and matrices.

In this report, specific recommendations are made for promoting existing external intercomparisons that should not be duplicated by the NCP QA program. For example, it is recommended that participation in the radionuclide studies offered by the International Atomic Energy Agency (IAEA) should be strongly encouraged, while participation in the interlaboratory assessments run by the National Water Research Institute (NWRI) or by the Canadian Association for Environmental Analytical Laboratories (CAEAL) should be mandatory for those NCP laboratories analyzing for nutrients, trace metals, and mercury in water. Some of the intercomparison studies reviewed in this report, are for parameters such as toxaphene, methylmercury and organotins, that are measured by only a few NCP laboratories. For these laboratories, participation in the pertinent Quality Assurance for Marine Environmental Monitoring in Europe (QUASIMEME) development exercises would be of great value.

RÉSUMÉ

Le présent rapport résume les résultats d'une enquête menée en 1998-1999 qui évalue l'utilité de divers programmes nationaux et internationaux d'assurance de la qualité (AQ) pour le Programme de lutte contre les contaminants dans le Nord (PLCN). Chaque programme externe d'AQ est évalué du point de vue des analytes cibles, des concentrations, des matrices des échantillons, des coûts, du calendrier et de la fréquence des études. Au moment de faire des recommandations concernant le recours de ces programmes externes pour répondre aux besoins de données de qualité du PLCN, d'autres facteurs, comme la nombre de laboratoires financés par le PLCN pour qui ces comparaisons externes seraient utiles, sont également pris en considération. Les études de comparaisons interlaboratoires qui sont jugées pertinentes compléteront celles réalisées par le programme d'AQ du PLCN lui-même, ce qui permettra d'avoir un programme d'AQ plus rentable qui porte sur une plus vaste gamme d'analytes et de matrices.

Les auteurs de ce rapport recommandent spécifiquement de promouvoir les comparaisons interlaboratoires existantes, qui ne devraient pas faire double emploi avec le programme d'AQ du PLCN. Par exemple, il est recommandé que la participation aux études des radionucléides de l'Agence internationale de l'énergie atomique (AIEA) soit vivement encouragée, alors que la participation aux évaluations interlaboratoires de l'Institut national de recherche sur les eaux (INRE) ou de l'Association canadienne des laboratoires d'analyse environnementale (ACLAN) devrait être obligatoire pour les laboratoires du PLCN qui effectuent des analyses sur les éléments nutritifs, les métaux-traces et le mercure dans l'eau. Certaines des comparaisons interlaboratoires examinées dans le présent rapport portent sur des produits chimiques comme le toxaphène, le méthylmercure et les composés organostanniques, qui sont mesurés par seulement quelques-uns des laboratoires du PLCN. Pour ces laboratoires, la participation aux exercices d'assurance de qualité pertinents pour la surveillance du milieu marin en Europe (QUASIMEME) serait extrêmement utile.

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Introduction

In October 1998, the authors, from the National Laboratory for Environmental Testing at the National Water Research Institute (NWRI) of Environment Canada conducted a survey of national and international interlaboratory quality assurance (QA) providers for the Northern Contaminants Program (NCP). The purpose of this survey was to provide a listing of external QA programs that would be suitable for assessing and providing assurance of the quality of data generated by the laboratories who contribute measurement data to the NCP, and that would complement a series of interlaboratory studies specific to the NCP QA program.

An initial telephone survey of organizations known to be involved in quality assurance activities such as intercomparison studies, reference material development, performance assessment or accreditation/certification programs, established a list of potential national and international QA programs for this review. Of particular interest were interlaboratory study (ILS) providers whose intercomparison exercises focused on the parameters and matrices pertinent to the NCP research studies, and who were willing to allow additional laboratories to join their program.

This report presents the results of the survey and describes the suitability of the various external QA programs for assessing the data generated by laboratories who produce measurement results for the NCP. It further provides recommendations on employing some of these external ILS programs to effectively bridge some of the gaps in the NCP QA program.

Organizations Surveyed

From the initial telephone survey, more than twenty national and international organizations were selected as potential providers of suitable interlaboratory QA programs or performance evaluation studies that would be complementary to the NCP QA program. For clarity in this report, they and their programs are identified by the following acronyms:

APG	Analytical Products Group, Inc., USA
AQUA	AQUA Check, Water Research Centre, United Kingdom
CAEAL	Canadian Association for Environmental Analytical Laboratories
CANMET	Canada Centre for Mineral and Energy Technology, Natural Resources Canada
CFIA-MB	Canadian Food Inspection Agency, Winnipeg
CFIA-ON	Canadian Food Inspection Agency, Ontario Operations Laboratory
CTQ	Centre de Toxicologie du Québec, CHUQ
ERA	Environmental Resource Associates, USA
Frontier	Frontier Geosciences, Washington, USA
IADN	Integrated Atmospheric Deposition Network
IAEA	International Atomic Energy Agency, Austria
ICES	International Council for Exploration of the Sea
INHL	Indian & Northern Health Laboratory, Health Canada
MAXXAM	MAXXAM Analytics Inc.
NOAA	National Oceanic and Atmospheric Administration
NIST	National Institute of Standards and Technology
NRC-INMS	National Research Council, Institute for National Measurement Sciences
NRC-IMB	National Research Council, Institute for Marine Biosciences
NWRI	National Water Research Institute, Environment Canada
QUASIMEME	Quality Assurance of Information for Marine Environmental Monitoring in Europe
RTC	Resource Technology Corporation, Wyoming, USA
WTI	Water Technology International Corporation

A written questionnaire was sent to each of the above organizations to acquire further details of their intercomparison exercises. A blank copy of the survey questionnaire "National and International Interlaboratory Quality Assurance (ILS) Programs Pertinent to the Northern Contaminants Program" can be found in Appendix A while the individual responses are compiled in Appendix B. Supplementary information and promotional materials that were provided by many of the respondents can be found in Appendix C.

Table 1 lists the names of the ILS programs evaluated for suitability to the NCP, and provides the names of the key contact people for each organization. Details for two of the European programs were obtained by consulting their catalogues of services, and consequently, no name is provided. In addition, it should be noted that the International Council for the Exploration of the Sea (ICES) no longer conducts an interlaboratory QA program. The laboratories who participated in these ILS studies are now involved in the QUASIMEME II International Laboratory Performance Studies.

Matrices and Parameters of Interest to the NCP Research Studies

Phase I of the NCP had a strong focus on environmental samples, such as water, air and sediment, in order to monitor sources, pathways, trends, and fate of contaminants in the Arctic environment. Phase II, on the other hand, places more emphasis on the presence, levels and consequences of contaminants in food sources and the diet of the Arctic population. Hence, the QA program of the NCP Phase II must also direct more attention to the analysis of biotic matrices such as fish, wildlife and human tissues, while recognizing that a number of researchers continue to monitor environmental samples.

The matrices and parameters of greatest interest to the NCP researchers were identified in an earlier survey entitled "*Summary Report of the Analytical Programs and Capabilities of Laboratories and Organizations that Contribute Measurement Data to the Northern Contaminants Program*". For 1998/99, the number of NCP measurement laboratories conducting analyses on the various sample types were identified as follows:

various biotic samples.....19
fish.....13
water.....18
sediment/soil.....13
human food stuffs.....4
animal feed.....2
snow.....4

urine 6

blood 6

mining products and effluents.....4

Thus, biotic samples of one form or another were the most commonly analyzed matrix material, with water and sediment samples also being quite common among the laboratories surveyed.

The above survey also identified the number of laboratories conducting analyses for the different contaminants of interest to the NCP. In general terms, they were identified as follows:

trace metals 12

mercury 13

radionuclides 6

nutrients (in water).....4

organochlorine pesticides (OCs) and PCBs.....16

dioxins and furans.....8

polynuclear aromatic hydrocarbons (PAHs).....4

toxaphene 8

organotins.....2

methylmercury 2

brominated diphenyl ethers (BPDEs).....1

With the number of laboratories conducting analyses for OCs, PCBs, toxaphene, dioxins and trace metals, the NCP could readily expect sufficient participating laboratories in its own series of intercomparison studies. The only limitation in finding sufficient participants would appear to be the selection of appropriate matrices for the check samples. Therefore, for nutrients in water, PAHs, organotins, and methylmercury, where fewer than five NCP laboratories conduct such analyses, a closer scrutiny of available external options is required to determine the most effective means of assuring the quality and intercomparability of the NCP measurements. At the same time, it would be beneficial to review the availability of external QA studies addressing the analysis of various types of biota and/or human tissue samples for all of the above parameters.

Available External Interlaboratory QA Programs

Table 2 compares the key aspects of the external QA programs reviewed in this survey. Included are details on typical concentration ranges for the target parameters in the various types of test samples, along with the number of samples per study, the frequency of studies being offered, and the approximate cost for participation. A summary of the parameters being offered in these ILS programs is presented in Table 3.

Fourteen organizations provide ILS exercises that deal with trace metals, of which ten include lead, arsenic and cadmium. Only eight of the trace metal programs include selenium. Thirteen QA programs specifically deal with mercury. Nine external QA programs address the analysis of OCs and PCBs, while two others address OCs only and one other, PCBs only. Five programs include nutrients, and six programs address the analysis of PAHs. Three or fewer external QA programs were found to address the analysis of toxaphene, dioxins/furans, methylmercury, organotins, or radionuclides. No single QA program provides exercises for all parameters of interest to the NCP.

Table 4 lists the analytes and matrices of the test samples for each of the interlaboratory comparison programs reviewed in this survey. The check samples include a wide variety of sample matrices including water, biota (e.g. fish, mussels, algae, lichen), human hair, sediment, soil, oil, sludge, air filters and blood. What must be noted, when reviewing tables 2 through 4, is that only a few of the intercomparison studies are repeated on a routine basis; i.e. many of the analyte/matrix combinations vary within the QA programs each year.

Criteria for Assessing Suitability of the External QA Programs to the NCP

From 1993 to 1997, the NCP QA program conducted a number of interlaboratory studies. The test sample matrices and target analytes are listed in Table 5. To include as many laboratories as possible, both standard solutions and real environmental samples (or extracts) were used. The use of standard solutions will continue to be required in the QA program for Phase II of the NCP

in order to provide for comparisons between laboratories who routinely handle and analyze different types of matrix samples.

For the purpose of this review, the following elements of the external ILS programs were considered, when assessing their "suitability" to the NCP QA program:

- Parameters of interest. NCP II is focused on contaminants in the food-chain, especially toxaphene, OCs/PCBs, mercury, selenium and methyl mercury.
- Concentration levels of contaminants. Bioaccumulation frequently results in higher levels of contaminants being measured in biota than those found in environmental samples, such as sediment and water.
- Matrix. With its stronger focus on contaminants in food sources, the QA studies of NCP II should address the measurement data generated for Arctic food sources, such as blubber and fish. (Toxicological assessments and analyses of human tissue samples, such as blood and urine, will be addressed elsewhere.)
- Number of NCP laboratories. Because many of the NCP-funded researchers contract their measurement analyses to the same core group of laboratories, the number of participants in an NCP ILS will be small. Thus, consideration for running an NCP ILS would be dependent on sufficient laboratories participating in the exercise. It follows, therefore, that the greatest need for external QA programs (to bridge gaps in the NCP QA program) will be where few NCP laboratories are conducting such measurements.
- Cost. For a laboratory conducting only a small number of analyses for the NCP research programs, participation in an expensive external ILS program would be prohibitive. In addition, as the number of laboratories conducting similar analyses in the NCP program increase, it may become more cost-effective for the NCP to conduct their own QA study.
- Timing and frequency. Some external programs are run infrequently, or cycle through a variety of different parameters of interest over several years. Consequently, the issue of encouraging NCP laboratories to participate in any external ILS program, needs to be reviewed each year, based on the availability of external studies on samples appropriate to the NCP research activities.

- Availability. Are the organizers of the external QA program willing to include additional external laboratories as participants?

The greatest need for external intercomparison studies is anticipated to be in the areas of organic contaminants in biota and for analyses of human tissue samples, because of the scarcity of laboratories conducting similar analyses.

Suitability of the External Interlaboratory QA Programs

APG - Analytical Products Group, Inc., USA

Analytical Products Group, Inc. operates the largest commercial environmental performance evaluation (PE) program in North America. It includes more than 1,000 laboratories from the US and Canada and has been used as the National Laboratory Certification program for the Republic of China. APG also operates two US state certification programs for environmental laboratories.

The APG performance evaluation programs are provided on a quarterly basis and are quite reasonable in cost. However, only the water matrix is addressed as they no longer provide PE programs for solid samples such as soils or sediments. [Ref.: personal communication with Carole at APG, Jan./99]. In addition, the organic check samples are provided as spiking solutions with which the laboratory analyst must spike their own matrix materials. It is therefore recommended that the APG PE programs not be considered as a substitute for the NCP's own interlaboratory studies. Nevertheless, it should be noted that they are one of the few organizations surveyed, that have laboratory control samples available for chlordane and toxaphene.

AQUA Check Program, Water Research Centre, United Kingdom

The AQUA Check program, run by the Water Research Centre in the United Kingdom, is used by 400 laboratories from 30 countries around the world to assess their performance on the analysis of up to 150 different metals and/or organic parameters. The test samples include clean

water, sewage water, industrial water, saline water, soil, marine sediment, and plants but do not address other forms of biota such as mussels. The cost of participation ranges from £200 to £400 per group of test parameters. Since sufficient information on the specific analytes and matrices of the test samples was not available at the time of writing this report, no recommendation about AQUA Check is being made for the NCP QA program at this time.

CAEAL - Canadian Association for Environmental Analytical Laboratories Inc.

The CAEAL Proficiency Testing Program is offered along with the SCC/CAEAL Laboratory Accreditation Program for Environmental Laboratories. There are currently 176 laboratory participants for 19 test classes of parameter in the CAEAL Proficiency Testing Program and it is expected to expand considerably in early 1999. A new proficiency testing program for the occupational health laboratories will be added [refer to MAXXAM information] and the BC Ministry of Environment will discontinue its EDQA program in favour of the CAEAL program.

The CAEAL program is of interest to the NCP QA program because it conducts performance studies for a wide range of parameters (organics, trace metals, major ions, physical parameters and nutrients). In particular, it is recommended that the NCP laboratories participate in the CAEAL series of studies for Nutrients in Water rather than conducting NCP ILSs for these analytes.

For the other parameters of interest to the NCP, water is the primary matrix used in the CAEAL studies, although there are check samples for a limited number of parameters in sediment, oil and air filters. However, because the levels of many of the analytes are quite high, and several of the specific contaminants of interest in the Arctic samples are not addressed (e.g. chlordanes, PCB congeners, toxaphene), it is recommended that the CAEAL organics program be considered only as a complementary series of available PE studies and not as a substitute for NCP ILSs.

CANMET - Canada Centre for Mineral and Energy Technology, Natural Resources Canada

CANMET's interlaboratory studies are generally not applicable to the NCP research work since they are directed at the analysis of metals in ores and rock.

CFIA-MB - Canadian Food Inspection Agency, Winnipeg

The Canadian Food Inspection Agency in Winnipeg conducts an interlaboratory QA program that specifically addresses the analysis of fish for total mercury. Approximately 30 laboratories participate in these quarterly studies and additional laboratories are welcome. There is no charge to participate at present and the CFIA is willing to share the raw data if the NCP QA program coordinator wishes to evaluate the NCP participants separately.

The CFIA test samples contain 0.1 to 1 ppm mercury in homogenized, autoclaved fish tissue in order to assess the analytical capabilities of the laboratories near the regulatory level of 0.5 ppm. Although the mercury in the fish samples is approximately 95% methylmercury [ref.: personal communication with E. Burns-Flett, MQAP Coordinator/CFIA], the studies do not specifically address the analysis for methyl mercury. In Environment Canada's *Summary Report of the Analytical Programs and Capabilities of Laboratories and Organizations that Contribute Measurement Data to the Northern Contaminants Program*, two laboratories (Freshwater Institute in Winnipeg and the National Wildlife Research Centre) were identified as conducting analyses for mercury and methylmercury in fish and other animal tissues. Thus, it is recommended that these facilities participate in the CFIA interlaboratory studies if the concentration levels are appropriate to the NCP samples they are studying. However, because the analysis of mercury and methylmercury in various other biotic samples are of key interest to the NCP, it is recommended that the NCP conduct their own interlaboratory studies for mercury and methylmercury using additional matrix check samples, such as mussels.

CFIA-ON - Canadian Food Inspection Agency, Ontario Operations Laboratory

The Ontario Operations Laboratory of the Canadian Food Inspection Agency conducts an annual interlaboratory QA study on the analysis of fish samples for total PCBs and 7 PCB congeners. There are currently 47 laboratories on the active participant list, from which 10-20 laboratories participate in any one study. The congeners evaluated are Nos. 28, 52, 101, 118, 138, 153, and 180. It is currently free although cost recovery is being considered.

This QA program would be suitable for several of the NCP measurement laboratories who are measuring fish tissues for PCBs. However, because it is limited to seven congeners and to fish samples, it is not recommended as a substitute for the NCP conducting their own series of PCB interlaboratory studies.

CTQ - Centre de Toxicologie du Quebec, CHUQ

CTQ provides an interlaboratory QA program for the analysis of metals in blood, serum and urine. This may not be a suitable QA program for the environmental laboratories but should be considered for those who are conducting measurements on tissues. Some laboratories who provide measurement data to the NCP, do analyze blood and urine samples (e.g. Envirotest, Health Canada's Indian and Northern Health Laboratory, and SRC Analytical) although there was no indication (in Environment Canada's first NCP survey) that they provide these types of measurements to the NCP. It is therefore recommended that, as the NCP QA program develops further toward incorporating human tissue samples as test materials, coordination with the CTQ QA program be evaluated further.

ERA - Environmental Resource Associates, USA

ERA conducts performance evaluation and certification services for over 40 US state and regulatory agencies. Their PE studies cover an extensive range of organic and inorganic parameters, primarily for assessing water and soil methodologies. The aqueous check samples are provided as spiking solutions for organics and the soil samples are prepared from 'clean" soils that have been fortified with known quantities of the contaminants of interest. While no recommendation is being made at this time to substitute any of the ERA InterlaB studies for an NCP coordinated ILS, their ability to design custom ILS programs, as detailed in their catalogue in Appendix C, may be of future interest to the NCP.

Frontier Geosciences, Washington, USA

Frontier Geosciences Inc. in Seattle, Washington has occasionally conducted an intercomparison study in the past but there are no routine ILS programs. However, they offer custom designing of ILSs with the customer's choice of parameters, matrices, and schedules. Their analytical

expertise is in the area of trace metals analysis including metal speciation. as well as the analysis of methyl and dimethyl mercury. Frontier Geosciences works in close collaboration with Axys Analytical Services of Sydney, BC, whose expertise is in the area of trace organics analysis, including dioxins/furans and congener PCBs. Matrices routinely investigated include freshwater, saltwater, porewater, sediment, soil, sewage sludge, and various biota (e.g. zooplankton, fish, mammals, mussels).

IADN - Integrated Atmospheric Deposition Network

At present the IADN program of interlaboratory studies is on hold, but it is being revised and is expected to resume in March 1999. Past ILSs have been directed at the analysis of organic contaminants in injection-ready solutions and for trace metals in water samples. For the participating laboratories, the service was free. However, with few exceptions, participation was generally restricted to the following laboratories who contributed to the IADN program:

1. One laboratory designated each year by the US-EPA
2. Environment Canada, NWRI (William Strachan) - precipitation
3. Environment Canada, AES, Downsview (Ray Hoff, Ken Brice) - air
4. Ontario Ministry of Environment and Energy, Rexdale, Ontario
5. Environment Canada, NLET/Ontario Region, (Melanie Nielson) - precipitation

Because the IADN QA program is restricted to the five laboratories who are part of the IADN network, this program is not open to other NCP measurement laboratories who are not in IADN. It is recommended however, that the NCP QA Program and the IADN QA program collaborate regularly on parameters, matrices and schedules.

IAEA - International Atomic Energy Agency, Austria

IAEA currently offers two QA paths: intercomparison exercises, which are being phased out over the next few years, and proficiency testing (PT) studies. The studies include both marine and terrestrial check samples for radionuclides, organics and trace metals, as well as isotope ratio determinations. The schedule of studies is advertised on an annual basis, but the analyte/matrix

combinations vary each year. The only participation fee for the studies is a "handling" charge of $50 US when results are submitted late.

IAEA is the only organization in this survey that offers QA intercomparisons for radionuclides. Since the recent NCP Measurement Laboratories Survey revealed that 6 organizations have the analytical capability for radionuclide measurements, it is recommended that the NCP investigate further, the specific QA needs of each of these facilities, to more closely evaluate the merit of conducting its own interlaboratory studies. Meanwhile, it is further recommended that these facilities participate in the IAEA radionuclide exercises, when the check sample matrices are appropriate to their NCP work. [The following two intercomparisons are scheduled: IAEA-410 in March 1999 and IAEA-411 in January 2000, both for anthropogenic and natural radionuclides at environmental levels in sediment.]

Several of the IAEA's other studies (for trace elements and organics) may also be suitable to the NCP QA program. However, since the target analytes and matrices vary each year, it is recommended that the NCP QA program review the suitability of IAEA's schedule of studies on an annual basis to ensure that unnecessary overlap does not occur. [The 1999/2000 schedule has not yet been received.]

INHL - Indian & Northern Health Laboratory, Medical Services Branch, Health Canada

Health Canada's Hair Mercury Quality Control Program runs two studies per year at no cost to the participants. Each of three samples consists of approximately 60 mg of ground hair and is to be analyzed for total and inorganic mercury, or for total mercury only. Because INHL's Mercury QC Program only addresses the analysis of hair samples, it would not be an adequate substitute for the mercury ILS needs of the NCP QA program which must also address samples such as air, water, sediment and biota.

MAXXAM - Maxxam Analytics Inc.

The occupational health PT program provided jointly by Maxxam (sample provision) and the Ontario Ministry of Labour (data evaluation), has recently been taken over by CAEAL. The new

program will focus on the air matrix, with samples being in the form of filters, impingers and charcoal tubes. This program would not serve as a suitable substitute for NCP coordinated ILSs because of the different target analytes being assessed, particularly for the organic contaminants.

NIST - National Institute of Standards and Technology, (for NOAA)

Under contract to NOAA, NIST conducts an annual intercomparison exercise for organic contaminants, including 18 PCB congeners, 22 OCs and 23 PAHs. The check samples consist of one marine sediment sample and one biotic sample, which alternates yearly between fish tissue and mussel or oyster tissue. Each year, 30 to 50 laboratories participate. Participation in the program is open to anyone, but the cost is $2800 US for a laboratory outside the US. Surplus materials from previous exercises are also available for $1150 US.

These intercomparison exercises are very appropriate to the NCP QA needs in that a lengthy list of pertinent parameters are included, and the test samples are naturally contaminated. However, despite its suitability, none of the NCP measurement laboratories surveyed participate in this program, perhaps due to the high participation fee. It is recommended, therefore, that the NCP measurement laboratories be made aware of the NIST-NOAA program and encouraged to participate in it. However, where there is a sufficient number of interested NCP laboratories, the NCP QA Program should be prepared to conduct its own exercises, despite the potential overlap in target analytes and matrices. On a broad scale, the latter route is likely to be more cost-effective.

NRC-INMS - National Research Council of Canada, Ottawa, (for NOAA)

The NRC's Institute for National Measurement Standards (INMS) in Ottawa has been providing QA services and expertise to NOAA's National Status and Trends Program for more than a decade. Their interlaboratory program provides one study annually and assesses the capabilities of laboratories to analyse marine sediments and biological tissues for 18 trace metals.

Traditionally, NOAA has limited the maximum number of participants to 50 and current enrollment is already approaching that number. The additional Canadian laboratories who have

joined the NOAA trace metal program are charged $300 per year by NRC. However, if more laboratories joined or if additional elements or parameters were requested other than those specified by the NOAA contract, the cost per laboratory would increase.

In Environment Canada's survey of the NCP measurement laboratories, both the Freshwater Institute and Nunavik Research Centre identified their participation in this program. It is recommended, therefore, that any other NCP laboratories conducting trace metals analysis on sediment and/or biological tissues consider participation in this QA program, rather than having the NCP duplicate what is already offered at reasonable cost by the NRC.

NRC-IMB - National Research Council of Canada, Halifax

The NRC's Institute for Marine Biosciences (IMB) does not currently run any ILS programs. However, they produce reference and certified reference materials for PCBs, PAHs, and trace elements which would be suitable as check samples for the NCP intercomparison studies.

NWRI - National Water Research Institute, Environment Canada

The NWRI has been conducting interlaboratory QA programs for organic and inorganic parameters for more than twenty-five years. The current inorganic QA program offers ten water samples for the analysis of major ions and nutrients, trace elements, total phosphorus and total mercury. The previous survey of NCP measurement laboratories identified four facilities who conduct analyses for nutrients in water. In view of the low cost for participation, it is recommended that these laboratories participate in either the NWRI QA program or CAEAL's PT exercises for nutrients in water.

QUASIMEME, Quality Assurance of Information for Marine Environmental Monitoring in Europe

The QUASIMEME program offers a wide variety of parameters (i.e. metals, organics, nutrients) in many different matrices (i.e. water, sediment, fish, shellfish) in its Laboratory Performance Studies (LPSs). It is directed at the marine environment and is one of only three QA programs that offers samples for toxaphene analysis. There is currently no annual subscription fee for QUASIMEME but each "study" costs from £245 to £370 (about $650-$1000 Cdn). The schedule

for the 1999 studies will be announced in March 1999 and is expected to be very similar to that of 1998. (Please refer to Appendix C for a copy of the 1998 schedule.)

In addition to the regular LPSs, QUASIMEME offers development exercises. In recent years, these have included organotins in standard solutions, seawater and shellfish, and toxaphene in standard solutions and fish extracts. The toxaphene development exercises are expected to continue. [Ref.: personal communication from Kieren Smith, QUASIMEME Project Office].

Because of the complexity of toxaphene and organotin analyses, and the difficulty in obtaining or producing valid test samples, it is recommended, that when available, participation in the QUASIMEME studies be encouraged. At present, only NLET and Nunavik Research Centre participate in this program. However, with eight NCP laboratories identifying themselves as conducting toxaphene analyses, it is also recommended that the NCP conduct their own toxaphene intercomparison exercises.

RTC - Resource Technology Corporation, USA

Resource Technology Corporation's Laboratory Proficiency Testing Program (LPTP) uses natural matrix materials to the greatest extent possible to simulate "real-world" conditions. Their studies include soil/sediment/sludge samples for trace metals, semi-volatiles or PCBs. Because of the number of domestic QA programs that offer similar target analytes and matrices, a recommendation for NCP participation in this program is not being made at this time. It should be noted, however, that RTC collaborates closely with other international PT providers and CRM producers and could be a valuable source for real matrix check samples.

WTI – Wastewater Technology International Corporation

WTI currently conducts an interlaboratory program for metals and nutrients in water for about 30 Brazilian laboratories and is willing to open it to additional participants. They are also a provider of test samples for the CAEAL certification studies and can provide similar custom samples for other ILS programs.

Additional Contacts

The following is a list of contacts for additional information on external interlaboratory QA programs that were not included in this survey:

- **US-EPA** (United States Environmental Protection Agency)
  Louis Bloom, QA Manager for the Great Lakes National Program Office
  Tel.: 312-353-2257
- **CAEAL** has information on additional organizations that may provide QA services. They are willing to share this information, but it was not available at the time of writing this report.
- **FAPAS** (Food Analysis Performance Assessment Scheme) - contaminants in food
  CSL Food Sciences Laboratory, Norwich Research Park, Colney, Norwich, NR4 7UQ, UK
  Tel.: 011-44 (0) 1603 590314; Fax: 011-44 (0) 1603 590281; Email: fapas@csl.gov.uk
- **Great Lakes Research Program** - (two studies per year on mercury, pesticides and congener PCBs in blood serum)
  Michael O'Keefe, MDCH/Labs, HRA Laboratory, PO Box 30035, Lansing, MI, USA, 48909
  Tel.: 517-335-9066 Fax: 517-335-9776 Email: okeefem@state.mi.us.
- **RIZA** (The Netherlands' water research institute)
  Henk Boekholt, Lelystad, The Netherlands
  Email: h.boekholt@riza.rws.minvenw.nl
- **IMEP** (International Measurement Evaluation Programme)
  Institute for Reference Materials and Measurements (IRMM), European Commission - Joint Research Centre, Geel, Belgium
  Telephone: +32 14 571702 or +32 14 571615; FAX: +32 14 591978

Recommendations

The results of an earlier survey, entitled "*Summary Report of the Analytical Programs and Capabilities of Laboratories and Organizations that Contribute Measurement Data to the Northern Contaminants Program*" revealed that a number of NCP-funded laboratories conduct highly specialized or unique analytical measurements. While it is clear that an ongoing series of

appropriate interlaboratory studies should be a key component of the NCP QA program, it also is apparent that it would be neither cost-effective nor informative to conduct NCP-directed QA studies for each and every type of analytical measurement and analyte/matrix combination for the small number of facilities conducting many of these novel measurements. From the current survey of available external interlaboratory QA programs, the following recommendations are offered to fill gaps (either by analyte or matrix) or to further complement the NCP QA program.

1. The NCP laboratories (especially those dealing with the water matrix), should participate in the PE programs offered by CAEAL, where appropriate. In addition to identifying proficiency to conduct certain analyses, ***SCC/CAEAL accreditation*** will recognize the existence and implementation of a sound Quality Management System in the laboratory.

2. ***Dioxins and Furans***. If the eight laboratories identified in the earlier NCP Survey continue to provide dioxin and furan data, then the NCP should conduct its own intercomparisons (focusing on both sediment and fish) and no recommendation is being made at this time for external QA program participation.

3. ***OCs and PCBs***. Because there are sufficient laboratories conducting OC/PCB analyses on a variety of matrices, the NCP QA program should conduct its own ILSs, and participation in any external intercomparisons should be at the laboratory's own discretion. Although rather expensive, the NOAA-NIST QA program is particularly recommended because of the similarity of target analytes and matrices to those being investigated in the NCP research studies. In addition, laboratories measuring PCBs in biota should consider participating in CFIA-ON's "PCBs in Fish" QA program for additional external quality assessment. However, this latter program could not serve as a replacement for participation in an NCP run ILS, because of the limited number of congeners addressed.

4. ***Toxaphene.*** If a sufficient number of laboratories continue to conduct toxaphene analyses for the NCP research studies, the NCP should conduct their own intercomparisons for toxaphene. However, it is recommended that these same laboratories also consider participating in

QUASIMEME's development exercises. To the greatest extent possible, the target analyte (i.e. congeners vs. total toxaphene) and the choice of matrix in the NCP studies should be complementary to those offered by QUASIMEME in order to avoid duplication and to provide as broad a base of QA assessment as possible for this difficult analysis.

5. It is recommended that the NCP make participation in an external QA program mandatory for NCP laboratories conducting analyses for ***nutrients in water***. Two suitable QA programs are offered by the NWRI of Environment Canada and by CAEAL. These two organizations also offer very good performance assessment programs for ***trace metals in water***, if needed.

6. The NCP laboratories who are conducting ***trace metal analyses in solid samples*** should be encouraged to join the NRC-INMS QA program for trace metals in marine sediments and biological tissues on a yearly basis, if the target metals, levels and matrix are appropriate.

7. Those laboratories measuring ***mercury in biota*** (especially fish) should be encouraged to participate in CFIA-MB's "Mercury in Fish" QA program, if the levels are appropriate to their research. There is no fee, and the studies are offered four times yearly.

8. Laboratories analyzing for ***methylmercury*** should participate in external intercomparisons, such as those offered previously by the IAEA and by QUASIMEME, when available. As long as only two NCP laboratories are conducting these analyses, it would be difficult to duplicate the full data assessment that would be available from a larger external intercomparison study. Similarly, the two NCP laboratories conducting ***organotin*** analyses should participate in external QA programs, when available.

9. It is recommended that the NCP laboratories conducting ***radionuclide*** measurements be encouraged to participate in the IAEA series of annual intercomparison studies for these analytes. A variety of sample matrices are offered, and there is no cost if results are returned in a timely manner (usually 4-5 months).

10. Laboratories who analyze ***blood and urine*** samples should consider CTQ's intercomparisons for metals and/or the studies conducted by the Great Lakes Research Centre (for mercury, pesticides and PCBs in blood serum). In addition, there are periodic intercomparison studies conducted by the IRMM in Belgium that have offered blood serum check samples in the past.

Summary

The participation of NCP laboratories in external interlaboratory QA programs can serve to address gaps in the NCP QA program where either the analyte or matrix is uncommon, and/or where the number of laboratories conducting these novel measurements is small. Clearly, the NCP QA program must review and consider accepting participation in these additional programs as supporting the NCP's data quality needs.

From the current review of external interlaboratory QA programs, it is recommended that the NCP not run intercomparison studies for the following analyses and that satisfactory performance in the following corresponding QA programs be considered an acceptable substitute:

- Nutrients in Water: NWRI or CAEAL
- Trace metals in Water: NWRI, CAEAL
- Mercury in Water: NWRI, CAEAL
- Radionuclides: IAEA, where analytes and matrices are appropriate to the NCP samples.

With the broad range of analyses being conducted within the NCP research studies, there will frequently be years when certain analyte/matrix combinations cannot be addressed by an NCP intercomparison. The following external QA programs are recommended to serve as measures to bridge these gaps, and/or as intercomparisons to supplement those offered concurrently by the NCP QA program:

- CFIA-ON: PCBs in fish [Note: only 7 congeners are addressed]
- CFIA-MB: Mercury in fish, where the mercury levels are similar to the NCP samples
- NIST-NOAA: OCs, PCB congeners, PAHs in sediment and fish/mussel/oyster tissue
- NRC-NOAA: trace metals in sediment and biota

- CTQ: metals in blood and urine

Finally, there are a number of external QA programs that have previously conducted (and are likely to continue to offer) intercomparisons that were very pertinent to the NCP research studies. However, because their check samples and target parameters vary from one year to the next, no specific recommendation can be made. In this category, the intercomparisons from the IAEA, QUASIMEME, and IMEP, especially for toxaphene, organotins and methylmercury, would be of considerable interest.

The combination of a carefully planned and coordinated series of NCP intercomparison studies with the above recommended participation by NCP measurement laboratories in external QA programs, would provide assurance to the NCP managers and researchers, of the quality and reliability of measurement results for a much broader range of analytes and matrices. Such participation in external programs would not only add value to the existing NCP QA program by bridging gaps or by complementing the NCP check samples, but would also contribute to an assessment of the comparability of NCP measurements to analytical data in other related international programs.

Table 1: Interlaboratory QA Programs Reviewed in this Survey

Organization	Name of Program	Contact for Participation
APG	APG Proficiency Testing Program	Tom Coyner
AQUA[a] (WRC)	AQUA Check Program, UK	Dr. Rodney Jones
CAEAL	CAEAL Proficiency Testing Program	Ginette Crew
CANMET	Proficiency Testing Program - Mineral Analysis Labs	Dr. Henry Steger
CFIA-MB	Mercury Quality Assurance Program	Erin Burns-Flett
CFIA-ON	Fish Check Sample Program	Gerald Shum
CTQ	CTQ Interlaboratory Comparison Program	Alain Leblanc
ERA	InterLaB WatR, InterLaB Soil; custom designing of ILSs	Shawn Kassner
Frontier	(No current ILS programs, but can custom-design one.)	Dr. Nicolas Bloom
IADN	Integrated Atmospheric Deposition Network QAPP	Sylvia Cussion
IAEA[b]	IAEA-AQCS (Analytical Quality Control Services) Intercomparison Exercises	(see catalogue)
ICES[c]	(No more interlaboratory studies; labs now in QUASIMEME.)	-
INHL	Hair Mercury Quality Control Program	Louis Bigras
MAXXAM	Ont. Min. of Labour/Assoc. of Chemical Profession of Ontario - Analytical QA Program	Dr. Ern Sullivan (Min. of Labour)
NOAA (NIST)	NOAA Intercomparison Exercise Program for Organic Contaminants in the Marine Environment	Dr. Michele Schantz
NOAA (NRC)	NOAA Intercomparison Exercise for Trace Metals in Marine Sediments and Biological Tissues	Dr. Scott Willie
NRC-IMB	Certified Reference Materials Program (no ILS programs)	Denise LeBlanc
NWRI	NWRI Ecosystem Quality Assurance Program	Harry Alkema
QUASIMEME[d]	QUASIMEME II International Lab. Performance (LP) Studies	(see catalogue)
RTC	RTC Laboratory Proficiency Testing Program (LPTP)	JoAnn Kearns
WTI	Brazil QA Program	Julie Mototsune

[a] Information was provided in a telephone conversation with Rodney Jones, Water Research Centre
[b] Information was gathered from the catalogue "AQCS 1998/1999 Intercomparison Runs/Reference Materials"
[c] Information was provided in a telephone conversation with Melody Carson, ICES
[d] Information was gathered from the catalogue, "The QUASIMEME Laboratory Performance Studies. Year 3. June 1998 to May 1999. Issue 4, February 1998."

Table 2: External Interlaboratory Program Details

QA program / Organization	Parameters	Matrix	Target Conc. Levels	#Samples per study	Schedule of studies	Cost for Participation in the Program
APG	22 Trace Metals including Hg, Se, As	Wastewater, drinking water	Typical ranges for wastewater, drinking water	2/study (Youden pairs)	WW - 12/year DW - 4/year	~$100 US /study
	Toxaphene	Water	0.1-5 µg/L 5-10 µg/L	"	"	~$69 US /study
	PCBs	Water	0.1-5 µg/L 5-10 µg/L	"	"	~$65 US /study
	Chlordane	Water	0.2-50 µg/L	"	4 per year	~$57 US /study
AQUA	30 different groups of 150 parameters (organics and metals)	Waters, (clean, sewage, saline); soils, marine sediment, plants	normal environmental levels	(not provided)	5 rounds/year (each round has a range of groups)	£200 - £400 per group of parameters
CAEAL	Metals/metal hydrides	Water	(not provided)	4/study	Mar., Oct.	$225 / study
	OCs, Total PCBs	Water	"	"	Jan., June	$450 / study
	PAHs	Water	"	"	Jan., June	$450 / study
	Total PCBs	Oil	"	"	Mar., Oct.	$180 / study
	Cd, Cu, Pb, Zn	Air filter	"	"	Mar., Oct.	$180 / study
	As, Cd, Cu, Pb, Hg, Zn	Soil	"	"	Jan., June	$240 / study
	PAHs	Soil	"	"	Jan., June	$300 / study
	Total Hg	Water	"	"	Mar., Oct.	$270 / study
CANMET	Au, Ag, Cu, Zn, Pb, Ni, Co	Rocks, ores	Exploration and ore grade (ppm to per cent)	4 or more	Oct., Apr., (must return data within one month)	Annual Fee: $800 Cdn. plus $50/metal for each additional method. Extra sets are $200/set plus $50/metal per method
CFIA-MB	Total mercury	Fish	0.2-1 ppm	4/study	Sept., Jan., May	No charge at present.
CFIA-ON	Total PCBs and 7 PCB congeners	Fish tissue	ppm, ppb	1 only	Once a year	Free now, cost recovery being considered

QA program / Organization	Parameters	Matrix	Target Conc. Levels	#Samples per study	Schedule of studies	Cost for Participation in the Program
CTQ	Pb, Cd, Hg (inorganic and organic)	Whole blood	0.5-3 μmol Pb/L <100 nmol Cd/L 25-300nmol Hg/L	3/ study	6/year (one annual report for all substances)	$120 US for registration + $130 US /substance (same for all) $130 US for Cu/Se/Zn in blood serum
	Al, Cu, Se, Zn	Blood serum	1-25 μmol/L			
	Cr, Se, Pb, Cu, As, Cd, Hg (inorganic)	Urine	< 100 nmol/L			
ERA: WatR™ Pollution:	OCs, Aroclors, PAHs, Trace metals	(provided as concentrates for spiking water)	(not provided)	one sample for each class/study	6/year	$82-$95 US /class of organics/study $68 US /trace metals/study
WatR™ Supply:	Toxaphene; Techn. chlordane; Trace metals	(provided as concentrates for spiking water)	(drinking water levels)	"	4/year	$63 US for each of toxaphene and chlordane per study $70 US /study (trace metals)
InterLaB™ Soil:	OCs, PCBs, PAHs, Trace metals	Soil	(not provided)	"	4/year	$150-$225 US /class of organics $150 US /study (trace metals)
IADN	PAHs, OCs, some PCB congeners	Standard solutions	(not provided)	(not provided)	(depends on funding)	No charge but participation restricted to five IADN labs.
	Metals	Water	"	"		
IAEA	Radionuclides	Marine samples (sediment)	environmental levels	1	3-4 month deadline for data	No charge to participate; but $50 US is charged if results are late
	Organics, MeHg, trace elements	Marine samples (sediment, fish)	"	"		
	Radionuclides, trace elements	Terrestrial samples (algae, lichen, soil)	elevated environmental levels	"		
	Isotope ratio determination	water, cellulose, $BaSO_4$	-	"		
INHL	Total Hg and Inorganic Hg	Hair	0.5 to 50 ppm	3	2/year	No cost
MAXXAM (will become a CAEAL program starting Jan/99)	Pb, Cd, Zn, Cr, As	Filter	0.01-5 mg/m^3	3 samples + 1 blank	4/year	Was free for labs in Ontario - CAEAL costs to be determined
	Mercury	Impinger	0.05 ppm			

QA program / Organization	Parameters	Matrix	Target Conc. Levels	#Samples per study	Schedule of studies	Cost for Participation in the Program
NOAA (NIST)	PAHs	Marine sediment	40-10,000 ng/g dry	2 samples per study (1 sediment + 1 fish or mussel)	1/year	$2800 US (for a non-US lab) (surplus samples are $1150 US)
	OCs, PCB congeners		1-150 ng/g dry			
	OCs, PCB congeners	Fish homogenate	1-150 ng/g dry			
	PAHs	Mussels	1-300 ng/g dry			
	OCs, PCB congeners		1-150 ng/g dry			
NOAA (NRC)	Trace metals	Sediment	pristine to contaminated	2	1/year	$300+ /year
	Trace metals	Oyster or mussel	variable	"	"	
NWRI	Mercury (total)	Water	0.005 - 0.4 µg/L	10	1/year	$250/study
	Trace elements	Water	0.1-500 µg/L	10	2/year	$550/study
	Major ions/ nutrients	Water	60-1000 µS/cm	10	2/year	$550/study
QUASIMEME	Nutrients, metals, Hg, chlorinated organics	Seawater, estuarine water	environmental levels	2-3	2/year	UK £245-£290 per group
	Trace metals, PAHs, chlorinated organics	Sediment	environmental levels	2	2/year	UK £280 per group
	Trace metals, PAHs, chlorinated organics, PCB congeners, dioxins/furans	Fish & shellfish	environmental levels	2	1 or 2/year	UK £310 - £370 per group
	Toxaphene	Sol'n & extracts	-	3	(once only dev't exercise)	UK £360
	Organotins	Calibration. sol'n, shellfish, seawater	-	3	(once only dev't exercise)	UK £360 per substrate type
RTC	All potable and waste water parameters	Water	per USEPA req'ts	29/WS 21/WP	Final report within 10 days	Depends upon level of participation.
	Trace Metals	Soil, sediment, sludge	natural levels	1 to 3		Frequency dependent
	Semi-Volatiles	Soil/sediment	natural levels	1 to 2		
	PCBs	Soil, sediment, oil	natural levels	1		
WTI	Nutrients	Water	1-160 mg/L	4	2/year	Not Provided
	Metals	Water	(not provided)	4	2/year	

Table 3: Target Parameters of External Interlaboratory Programs

Parameter	APG	AQUA	CAEAL	CANMET	CFIA-MB	CFIA-ON	CTQ	ERA	IADN	IAEA	INHL	MAXAM	NOAA-NIST	NOAA-NRC	NWRI	QUASIMEME	RTC	WTI	Total no. of ILS programs
Trace Metals	•	•	•	•			•	•	•	•		•		•	•	•	•	•	14
Hg	•	•	•		•		•	•		•	•	•		•	•	•	•		13
As	•	•	•				•	•	•			•		•	•	•	•		10
Se	•	•	•				•	•	•	•				•	•				8
Cd	•	•	•				•	•	•	•		•		•	•	•	•		11
Pb	•	•	•	•			•	•	•	•		•		•	•	•	•		12
Nutrients			•					•							•	•		•	5
OCs	•	•	•					•	•	•		•	•			•	•	•	11
Chlordane	•								•										1
PCBs	•	•	•			•		•	•	•			•			•	•		10
Dioxins/furans								•								•			2
PAHs		•	•					•	•				•			•			6
Toxaphene	•							•								•			3
Methylmercury										•						•			2
Organotins																•			1
Radionuclides										•									1

Table 4: Analytes and Matrices Tested in Interlaboratory Programs

Parameter	Analytes	Matrices
APG	Trace metals (incl. Hg, Se, As), OCs/PCBs, Toxaphene	Water
AQUA	Trace metals, Organics	Water, sewage, soil, (marine) sediment, biota
CAEAL	Trace metals, Nutrients, OCs/PCBs, PAHs	Water, sediment/soil, oil, air filters
CANMET	Trace metals including Pb	Rocks, ores
CFIA-MB	Hg	Fish
CFIA-ON	PCBs	Fish
CTQ	Trace metals, (incl. Hg, As, Se)	Blood, urine
ERA	Trace metals, Nutrients, OCs/PCBS, PAHs, Dioxins/Furans	Water, soil, oil, customized samples
IADN	Trace metals, OCs/PCBs, PAHs	Standard solutions, water
IAEA	Trace metals, OCs/PCBs, Methyl-Hg, Radionuclides	Sediment, fish, lichen, algae, coral sand, soil, water
INHL	Hg	Human hair
MAXXAM	Trace metals, (incl. Hg, Pb, As), OCs	Filters, impingers, charcoal, blood
NOAA-NIST	OCs/PCBs, PAHs	Sediment, mussels, fish
NOAA-NRC	Trace metals (incl. Hg, Se, As)	Sediment
NWRI	Trace metals, Major Ions & Nutrients, Hg	Water
QUASIMEME	Trace metals, PAHs, Nutrients, Chlorinated organics, VOCs, PCBs, Dioxins/furans, Toxaphene, Organotins, Methyl-Hg	Seawater, estuarine water, soil, sediment, fish, shellfish, standard solutions and extracts
RTC	Trace Metals, (incl. Hg, As), OCs/PCBs	Water, soil, sediment, sludge, oil
WTI	Trace Metals, Nutrients, OCs	Water, soil

Table 5: Previous NCP Interlaboratory Studies

Parameters	Test Matrix	No. Participants	Date
Cd, Pb, Hg	caribou kidney	5	92/93
13 OCs + 28 PCB congeners	polar bear fat extract	6 5	92/93
15 PCB congeners	iso-octane solution	10	93/94
19 OCs	5:95 toluene/iso-octane	10	94/95
13 OCs + 12 PCB congeners	ringed seal blubber extract (lipid removed)	10 9	94/95
coplanar PCBs	iso-octane solution	6	94/95
PCDD/PCDFs	iso-octane solution	3	94/95
10 PAHs	sediment	3	94/95
19 OCs + 15 PCB congeners	standard solution	8 8	95/96
coplanar PCBs + PCDD/PCDFs	iso-octane solution	4 3	95/96

Appendix A:
Blank Survey

October 5, 1998

RE: Quality Assurance Program Questionnaire

Dear Quality Assurance Program Survey Participant:

Please find attached "Questionnaire 2: National and International Inter-laboratory Quality Assurance (ILS) Programs Pertinent to the Northern Contaminants Program." Environmental Standards and References Materials (ESRM), at the National Water Research Institute, is having an investigation conducted to determine the availability of external quality assurance programs that could be appropriate for labs doing analyses for the Northern Contaminants Program. Therefore, your organization may be able to provide valuable services that will aid this program. What follows is a brief description of the information requested:

- PART A requests contact information that will enable ERSM to contact your organization, request additional information or inquire about participation in a quality assurance program.
- PART B requests details about the quality assurance (ILS) programs that you provide. Please take note of our main parameters of interest. Include any additional comments you feel are relevant to describe your capabilities. Finally, in order to help ESRM complete a most comprehensive listing of available ILS programs, please suggest other contacts or organizations that may provide additional information or quality assurance services

If you wish to include printed promotional materials or flyers that (A) fully answer all questions in the questionnaire (i.e. instead of filling out the questionnaire in cases where the list of relevant capabilities is large), or, (B) you feel would add to ESRM's understanding of your capabilities, please mail or courier them to the following address to be received no later than October 15, 1998 in order to be included in the survey:

Attention: Glynn Gomes
116 River Oaks Blvd. East
Oakville, Ontario, Canada
L6H 4C5

If possible, the preference is that you e-mail the response to the questionnaire to **gomesg@globalserve.net** (in MS Word 6.0 /95 or '97 format). Alternatively, it can be faxed to (905) 338-9579. Thank you for expressing interest and taking the time to participate in this information gathering exercise. If you have any questions, please contact me at (905) 338-2927.

Sincerely,

Glynn Gomes

Questionnaire 2: National and International Interlaboratory Quality Assurance (ILS) Programs Pertinent to the Northern Contaminants Program

PART A: IDENTIFYING INFORMATION

1. Name of Organization Conducting ILS Program		
2. Name of ILS Program:		
3. Name and title of person completing this survey:		
4. Contact name and title of contact person for requesting participation in the study or program:		
5. Address:		
Phone:	**Fax:**	**Email:**

PART B: MATRICES AND PARAMETERS INVESTIGATED

Please tell us what components your quality assurance program involves. What parameters are analyzed and in which matrices (e.g. toxaphene in air, mercury in blood, etc.). What is the target concentration to be analyzed? How many samples are tested for each study? Please give an indication of the schedule of the ILS program (e.g. how many times is the program conducted each year? When do participants receive the results?). Finally, please give an indication of the cost of participation in the study.

6. Specific Parameters of Interest: toxaphene, chlordane, HCHs, congener PCBs, PCNs, radionuclides, methyl mercury, mercury, selenium, arsenic, cadmium, others (Please attach an additional page if required.)					
Parameter (e.g. trace metals, toxaphene, mercury)	**Matrices Investigated** (e.g. water, air, sediment, biota, human samples, etc.)	**Target Concentration Levels**	**# Samples/Study**	**Schedule of ILS Program (# times per year; when is the final report made?)**	**Cost for Participation in the Program**

7. Additional Comments (e.g. how large is the program; how many labs are involved; from what geographical locations?)
8. In order to help us complete a most comprehensive listing of available ILS programs, please suggest other contacts or organizations that may provide additional information or quality assurance services.

Please add any other information or comments that you feel would add value to the above survey.

Please return to: Glynn Gomes Tel. (905) 338-2927 Fax: (905) 338-9579 Email: gomesg@globalserve.net

Appendix B:
Survey Responses

Questionnaire 2: National and International Interlaboratory Quality Assurance (ILS) Programs Pertinent to the Northern Contaminants Program

PART A: IDENTIFYING INFORMATION

1. Name of Organization Conducting ILS Program Analytical Products Group, Inc.		
2. Name of ILS Program: Proficiency Testing Program		
3. Name and title of person completing this survey: Tom Coyner General Manager		
4. Contact name and title of contact person for requesting participation in the study or program: Tom Coyner General Manager		
5. Address: Analytical Products Group, Inc. 2730 Washington Blvd. Belpre, Ohio 45714 USA		
Phone: 740-423-4200	**Fax:** 740-423-5588	**Email:** apg@citynet.net

PART B: MATRICES AND PARAMETERS INVESTIGATED

Please tell us what components your quality assurance program involves. What parameters are analyzed and in which matrices (e.g. toxaphene in air, mercury in blood, etc.). What is the target concentration to be analyzed? How many samples are tested for each study? Please give an indication of the schedule of the ILS program (e.g. how many times is the program conducted each year? When do participants receive the results?). Finally, please give an indication of the cost of participation in the study.

6. Specific Parameters of Interest: toxaphene, chlordane, HCHs, congener PCBs, PCNs, radionuclides, methyl mercury, mercury, selenium, arsenic, cadmium, others (Please attach an additional page if required.)					
Parameter (e.g. trace metals, toxaphene, mercury)	**Matrices Investigated** (e.g. water, air, sediment, biota, human samples, etc.)	**Target Concentration Levels**	**# Samples/Study**	**Schedule of ILS Program (# times per year; when is the final report made?)**	**Cost for Participation in the Program**
Trace Metals **(22metals including** **Hg, Se, As, Sb)**	**Water**	**Varies by Metal,** **typical wastewater &** **drinking water ranges**	**Two samples per study** **(Youden pairs)**	**Wastewater 12/year** **Drinking Water 4/yr**	**~100.00/study**
Toxaphene	**Water**	**0.1-5 ug/L** **5-10 ug/L**	**As above**	**As above**	**~69.00/study**
PCB's	**Water**	**0.1-5 ug/L** **5-10 ug/L**	**As above**	**As above**	**~65.00/study**
Chlordane	**Water**	**0.2-50 ug/L**	**As above**	**4/per**	**~57.00/study**

See attached list of additional samples					

7. Additional Comments (e.g. how large is the program; how many labs are involved; from what geographical locations?)

Analytical Products Group, Inc. operates the largest commercial environmental PE program in North America. It includes more than 1,000 laboratories from the US and Canada. It has been used as the National Laboratory Certification program for the Republic of China. APG also operates state certification programs for environmental laboratories.

8. In order to help us complete a most comprehensive listing of available ILS programs, please suggest other contacts or organizations that may provide additional information or quality assurance services.

See AQUACheck program of the Laboratory of the Government Chemist in the UK and programs of CCIW.

Please add any other information or comments that you feel would add value to the above survey.

Please return to: Glynn Gomes Tel. (905) 338-2927 Fax: (905) 338-9579 Email: gomesg@globalserve.net

Analytical Products Group, Inc. 2730 Washington Blvd. Belpre, Ohio 45714

Standards Available:

Demand	BOD,COD,CBOD,TOC
Nutrients	NH3-N, NO3-N, PO4-P, Total P, TKN
Solids	Suspended, Dissolved, Total
Trace Metal	22 Metals
Cyanide	Total Cyanide, Amenable to Chlorination
Phenolics	Total by 4AAP Method
PH	
Hexavalent Chromium	
Total Organic Halide	TOX
Volatiles	EPA Methods
Semi-Volatile	EPA Methods
Polynuclear Aromatics	EPA Methods
BTEX Compounds	Benzene, Toulene, Ethylbenzene, Xylenes
Chlorinated Pesticides	EPA Methods
Herbicides	EPA Methods
Fluoride	
Diesel Fuel	Diesel Fraction of Total Petroleum Hydrocarbons
Gasoline	Gasoline Fraction of Total Petroleum Hydrocarbons
Oil & Grease	EPA Methods Gravimetric & Hexane Extraction
Trihalomethanes	EPA Method

A complete literature package will be supplied under separate cover.

Price List

(Effective 7/8/98)

Laboratory Control Samples

Waste Water Laboratory Control Samples

1074 or 1075	Demand	$50.00
2184 or 2185	Nutrients	$50.00
3663 or 3664	Solids	$46.00
4849 or 4950	Oil & Grease	$45.00
4873	Minerals	$59.00
3372	pH	$30.00
7878 or 7879	Trace Metals	$70.00
4167 or 4168	Phenolics	$32.00
9211 or 9212	Cyanide	$35.00
6682 or 6683	Residual Chlorine	$35.00
1110 or 1111	Aluminum High	$30.00
7921 or 7922	Fluoride	$28.00
7762 or 7763	TOX	$38.00
7744 or 7745	Hex Chromium	$32.00
1535 or 1536	Uranium	$35.00
6001 or 6002	Volatiles	$77.00
6333 or 6334	Acids	$65.00
5804 or 5805	Base Neutrals	$70.00
5961 or 5962	Pesticides	$60.00
8101 or 8102	PAH	$67.00
8001 or 8002	BTEX	$75.00
9401	Gasoline	$70.00
9407	Diesel Fuel	$70.00
9411	TPH 418.1 for IR	$55.00
5751 or 5752	PCB	$65.00
4901 or 4902	Toxaphene	$55.00
4852 or 4853	IR Oil Grease	$50.00

Drinking Water Laboratory Control Samples

10202	Chlordane	$52.00
10302	Cyanide	$46.00
10402	EDB or DBCP	$58.00
10802	Minerals	$58.00
10902	Nitrite	$46.00
11002	PCB	$69.00
11102	Pesticides	$65.00
11602	Residual Chlorine	$46.00
11502	Solids	$46.00
11702	Toxaphene	$58.00
10702	Trace Metals	$52.00
11802	Tri-halomethanes	$69.00
11902	Turbidity	$46.00
12002	Unregulated Volatiles	$86.00

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2730 Washington Boulevard, Belpre, OH 45714
740-423-4200 • 800-272-4442 • Fax 740-423-5588

Price List

(effective 7/8/98)

Performance Evaluation Samples

Drinking Water Performance Evaluation

10100	Carbamate Pesticides	$69.00
11100	Pesticides	$79.00
10200	Chlordane	$57.00
10300	Cyanide	$45.00
10400	EDB/DBCP	$55.00
10600	Herbicides	$58.00
10800	Minerals	$65.00
10900	Nitrite	$45.00
11000	PCB	$63.00
11100	Pesticides	$79.00
11200	Regulated SOC	$70.00
11300	Regulated Volatiles	$81.00
11400	Semi-Volatiles	$80.00
11500	Solids	$50.00
11600	Residual Chlorine	$45.00
11700	Toxaphene	$55.00
10700	Trace Metals	$64.00
11800	Trihalomethanes	$77.00
11900	Turbidity	$50.00
12000	Unregulated Volatiles	$81.00

Drinking Water PE Samples are offered:

March, June, September & December

Waste Water Performance Evaluation

100	Demand	$58.00
200	Nutrients	$58.00
300	Solids	$58.00
400	Oil & Grease	$45.00
500	Minerals	$70.00
600	pH	$35.00
700	Trace Metals	$100.0
800	Phenolics	$40.00
900	Cyanide	$45.00
1000	Residual Chlorine	$40.00
1100	Aluminum High	$28.00
1200	Fluoride	$32.00
1300	TOX	$41.00
1400	Hexavalent Chromium	$39.00
1500	Uranium	$28.00
2000	Volatiles	$95.00
2100	Acids	$91.00
2200	Base Neutrals	$95.00
2300	Pesticides	$95.00
2500	PAH	$62.00
2600	BTEX	$79.00
2700	Gasoline*	$81.00
2800	Diesel Fuel*	$79.00
2900	TPH 418.1 for IR*	$75.00
3000	PCB*	$65.00
3100	Toxaphene*	$69.00

*** Only offered January, April, July, & October.**

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2730 Washington Boulevard, Belpre, OH 45714
740-423-4200 • 800-272-4442 • Fax 740-423-5588

Questionnaire 2: National and International Interlaboratory Quality Assurance (ILS) Programs Pertinent to the Northern Contaminants Program

PART A: IDENTIFYING INFORMATION

1. Name of Organization Conducting ILS Program Water Research Centre		
2. Name of ILS Program: The AQUA Check Program		
3. Name and title of person completing this survey: Dr. Rodney Jones		
4. Contact name and title of contact person for requesting participation in the study or program: Dr. Rodney Jones		
5. Address: Medmenham Henley Road, Medmenham, PO Box 16, Marlow SL7 2HD, UK		
Phone: 011-44 (0) 1491 571531	**Fax:** 011-44 (0)1491 579094	**Email:**

PART B: MATRICES AND PARAMETERS INVESTIGATED

Please tell us what components your quality assurance program involves. What parameters are analyzed and in which matrices (e.g. toxaphene in air, mercury in blood, etc.). What is the target concentration to be analyzed? How many samples are tested for each study? Please give an indication of the schedule of the ILS program (e.g. how many times is the program conducted each year? When do participants receive the results?). Finally, please give an indication of the cost of participation in the study.

6. Specific Parameters of Interest: toxaphene, chlordane, HCHs, congener PCBs, PCNs, radionuclides, methyl mercury, mercury, selenium, arsenic, cadmium, others (Please attach an additional page if required.)					
Parameter (e.g. trace metals, toxaphene, mercury)	**Matrices Investigated** (e.g. water, air, sediment, biota, human samples, etc.)	**Target Concentration Levels**	**# Samples/Study**	**Schedule of ILS Program (# times per year; when is the final report made?)**	**Cost for Participation in the Program**
150 parameters: metals, organics	Clean waters, sewage water, industrial water, saline water, soils, marine sediment, biota (plant; no mussels)	The concentration is randomly chosen from within the range of concentrations found in the environment.		5 rounds per year. There are a range of groups offered in each round, e.g. PCBs in soil, typical metals in clean water. There are 30 groups and 150 parameters.	£200 to £400 per group
No radionuclides					

7. Additional Comments (e.g. how large is the program; how many labs are involved; from what geographical locations?)

There are 400 laboratories, from 30 countries around the world, involved in this program. WRC also distributes software to allow companies to submit their data electronically and to keep records of data sent.

8. In order to help us complete a most comprehensive listing of available ILS programs, please suggest other contacts or organizations that may provide additional information or quality assurance services.

Contact:
FAPAS (Food Analysis Performance Assessment Scheme)
CSL Food Sciences Laboratory
Norwich Research Park
Colney, Norwich
NR4 7UQ, United Kingdom

Tel.: 011-44 (0) 1603 590314
Fax: 011-44 (0) 1603 590281
Email: fapas@csl.gov.uk

Please add any other information or comments that you feel would add value to the above survey.

Please return to: Glynn Gomes Tel. (905) 338-2927 Fax: (905) 338-9579 Email: gomesg@globalserve.net

Questionnaire 2: National and International Interlaboratory Quality Assurance (ILS) Programs Pertinent to the Northern Contaminants Program

PART A: IDENTIFYING INFORMATION

1. Name of Organization Conducting ILS Program Canadian Association for Environmental Analytical Laboratories (CAEAL) Inc.		
2. Name of ILS Program: CAEAL Proficiency Testing Program		
3. Name and title of person completing this survey: Ginette Crew, Program Administrator		
4. Contact name and title of contact person for requesting participation in the study or program:		
5. Address: 265 Carling Avenue, Suite 300 Ottawa, ON K1S 2E1		
Phone: 613-233-5300	Fax: 613-233-5501	Email: gcrew@caeal.ca

ACLAE

CAEAL

October 14, 1998

Mr. Glynn Gomes
Environmental Consultant
116 River Oaks Blvd. East
Oakville, ON L6H 4C5

Dear Mr. Gomes:

Thank you for including the CAEAL Proficiency Testing Program in the survey you are undertaking for the National Water Research Institute. This program is offered along with the SCC/CAEAL Laboratory Accreditation Program for Environmental Laboratories.

Attached are several pages in response to your survey. For Part B, I have numbered your six columns, and indicated my response to each column on the attached list from our Application Form. We will be introducing extensive fee reductions on February 1, 1999; these reductions have been noted on the list. Please do not hesitate to contact me should you have difficulty interpreting what I have written.

We currently have 176 laboratories participating in the CAEAL Proficiency Testing Program; this number has been increasing steadily over a number of years. A breakdown of participation by province is attached.

In early 1999, our program will be expanding considerably as a result of two key developments. We will be offering a new proficiency testing program for occupational health laboratories. Furthermore, the BC Ministry of Environment has announced that it will be discontinuing its EDQA program in favour of the CAEAL program; this will result in an influx of laboratories from that province.

I have enclosed a package of information about our Association and its programs. I would be happy to discuss any questions you may have as you complete your survey.

Sincerely,

Ginette Crew
Program Administrator

Enc.

Canadian Association for Environmental Analytical Laboratories (Inc.)
Suite 300, 265 Carling Avenue, Ottawa, Ontario K1S 2E1
Phone: (613) 233-5300 Fax: 233-5501 http://www.caeal.ca
Association canadienne des laboratoires d'analyse environnementale (inc.)

Laboratory Participation by Province in the CAEAL Proficiency Testing Program

Province	# of Labs
British Columbia	25
Alberta	18
Saskatchewan	5
Manitoba	8
Ontario	84
Quebec	4
New Brunswick	14
Newfoundland	8
Nova Scotia	7
PEI	1
Yukon	1
Northwest Territories	1
Total	**176**

PART B: MATRICES AND PARAMETERS INVESTIGATED

Please tell us what components your quality assurance program involves. What parameters are analyzed and in which matrices (e.g. toxaphene in air, mercury in blood, etc.). What is the target concentration to be analyzed? How many samples are tested for each study? Please give an indication of the schedule of the ILS program (e.g. how many times is the program conducted each year? When do participants receive the results?). Finally, please give an indication of the cost of participation in the study.

6. Specific Parameters of Interest: toxaphene, chlordane, HCHs, congener PCBs, PCNs, radionuclides, methyl mercury, mercury, selenium, arsenic, cadmium, others (Please attach an additional page if required.)

Parameter (e.g. trace metals, toxaphene, mercury)	**Matrices Investigated** (e.g. water, air, sediment, biota, human samples, etc.)	**Target Concentration Levels**	**# Samples/Study**	**Schedule of ILS Program (# times per year; when is the final report made?)**	**Cost for Participation in the Program**
(1)	(2)	(3)	(4)	(5)	(6)
		↓			
		this information is unavailable at this time			
			always 4 samples per study; 2 studies per year		

APPLICATION FORM

ACCREDITATION PROGRAM FOR ENVIRONMENTAL LABORATORIES

5.0 PERFORMANCE EVALUATION PARTICIPATION

The granting of accreditation is dependent on satisfactory participation in PE testing (i.e. proficiency testing) where such testing is offered as a part of the accreditation.

The table below identifies all tests which are a part of the PE testing program. Please show the (additional) participation you require by adding (i) a check (√) mark to the appropriate box and (ii) the appropriate test method (see section 6.0 for the applicable definition of test method).

OPEN BOXED AREAS FOR CAEAL USE ONLY

Test Group	Test parameter (1)	matrix (2)	test method (6)	
C-1 Major Ions	Alkalinity (pH 4.5)	Water		☐
March/Oct	Chloride	Water		☐
(5)	Conductivity (25 °C)	Water		☐
	Dissolved Calcium	Water		☐
	Dissolved Magnesium	Water	(Inorganic)	☐
	Fluoride	Water		☐
	Potassium	Water	$270 per study	☐
	Sodium	Water	$240 " "	☐
	Nitrate	Water	after Feb 1/99	☐
	Nitrate plus Nitrite	Water		☐
	Reactive Silica	Water		☐
	Sulfate	Water		☐
C-2 Metals/Metal Hydrides	Dissolved Cadmium	Water		☐
	Dissolved Cobalt	Water		☐
	Dissolved Chromium	Water		☐
	Dissolved Copper	Water		☐
March/Oct	Dissolved Iron	Water	(Inorganic)	☐
	Dissolved Manganese	Water		☐
	Dissolved Nickel	Water	$270 per study	☐
	Dissolved Lead	Water	$225 after	☐
	Dissolved Vanadium	Water	Feb 1/99	☐
	Dissolved Zinc	Water		☐
	Total Antimony	Water		☐
	Total Arsenic	Water		☐
	Total Selenium	Water		☐
C-3 TKN and TP	Total Kjeldahl Nitrogen	Water	(Inorganic)	☐
March/Oct.	Total Phosphorus	Water	$150 per study	☐
			$135 after Feb 1/99	

PERFORMANCE EVALUATION PARTICIPATION, CONTINUED

Test Group	Test: parameter	matrix	test method	
C-4A TSS March/Oct	Total Suspended Solids	Water (Inorganic)	$180 per study $150 after Feb 1/99	☐ __
C-4B BOD March/Oct	BOD (5 day)	Water (Inorganic)	$180 per study $150 after Feb 1/99	☐ __
C-5 Coliforms Jan/June	Fecal Coliforms	Water	(Microbiology)	☐ __
	Total Coliforms	Water	$360 per study	☐ __
C-6 OCP/PCB Jan/June	Endosulfan I	Water		☐ __
	Endosulfan II	Water		☐ __
	Endrin	Water		☐ __
	Lindane	Water	(Organic)	☐ __
	Mirex	Water		☐ __
	o,p' - DDT	Water	$450 per study	☐ __
	p,p' - DDT	Water		☐ __
	p,p' Methoxychlor	Water		☐ __
	a - BHC	Water		☐ __
	Heptachlor Epoxide	Water		☐ __
	Total PCB	Water		☐ __
C-7 PAH Jan/June	Benzo (a) pyrene	Water		☐ __
	Benzo (b) fluoranthene	Water	(Organic)	☐ __
	Benzo (g,h,i) perylene	Water		☐ __
	Benzo (k) fluoranthene	Water	$450 per study	☐ __
	Fluoranthene	Water		☐ __
	Indeno (1,2,3-cd) pyrene	Water		☐ __
	Pyrene	Water		☐ __
	Benzo (a) anthracene	Water		☐ __
	Phenanthrene	Water		☐ __
C-8 PCB in Oil March/Oct	Total PCB	Oil	$180 per study	☐ __
C-9 Metals on Filters March/Oct	Cadmium	Air Filter		☐ __
	Copper	Air Filter		☐ __
	Lead	Air Filter	$180 per study	☐ __
	Zinc	Air Filter		☐ __
C-10 Major Ions on Filters March/Oct	Chloride	Air Filter		☐ __
	Fluoride	Air Filter		☐ __
	Nitrate	Air Filter	$180 per study	☐ __
	Sulfate	Air Filter		☐ __

PERFORMANCE EVALUATION PARTICIPATION, CONTINUED

Test Group	Test parameter	matrix	test method	
March/Oct. C-11 Trout LC50	Trout LC50 (96 h)	Water	(Toxicologu) $360 per study ~~$330 after Feb 1/99~~	☐
March/Oct. C-12 DaphniaLC50	Daphnia LC50 (48 h)	Water	"	☐
March/Oct. C-13 Microtox IC50	Microtox IC50 (15 min)	Water	(Toxicologu) $360/$270 after Feb 1/99	☐
March/Oct. C-14 CN (SAD)	CN (SAD)	Water	(Inorganic) $180/study	☐
March/Oct. C-15 pH	pH	Water	(Inorganic) $120/study $90 after Feb 1/99	☐
C-16 BTEX/THM Jan/June	Benzene	Water	(Organic) $480 per study	☐
	Toluene	Water		☐
	Ethylbenzene	Water		☐
	o-xylene	Water		☐
	p-xylene	Water		☐
	Bromoform	Water		☐
	Chloroform	Water		☐
	Bromodichloromethane	Water		☐
	Chlorodibromomethane	Water		☐
C-17 Metals in Soil Jan/June	Arsenic	Soil	Soil/Sediment $240 per study	☐
	Cadmium	Soil		☐
	Copper	Soil		☐
	Lead	Soil		☐
	Mercury	Soil		☐
	Zinc	Soil		☐
C-18 PAH in Soil Jan/June	Benzo (a) pyrene	Soil	Soil/Sediment $300 per study	☐
	Benzo (b) fluoranthene	Soil		☐
	Benzo (g,h,i) perylene	Soil		☐
	Benzo (k) fluoranthene	Soil		☐
	Fluoranthene	Soil		☐
	Indeno (1,2,3-cd) pyrene	Soil		☐
	Pyrene	Soil		☐
	Benzo (a) anthracene	Soil		☐
	Phenanthrene	Soil		☐
C-19 Mercury March/Oct.	Total Mercury	Water	(Inorganic) $270 per study.	☐

7. Additional Comments (e.g. how large is the program; how many labs are involved; from what geographical locations?)

8. In order to help us complete a most comprehensive listing of available ILS programs, please suggest other contacts or organizations that may provide additional information or quality assurance services.

We have information on a large number of providers, but it is not summarized. We are happy to share this information, but it is not conveniently available at this time.

Please add any other information or comments that you feel would add value to the above survey.

Please return to: Glynn Gomes Tel. (905) 338-2927 Fax: (905) 338-9579 Email: gomesg@globalserve.net

Questionnaire 2: National and International Interlaboratory Quality Assurance (ILS) Programs Pertinent to the Northern Contaminants Program

PART A: IDENTIFYING INFORMATION

1. Name of Organization Conducting ILS Program Mining and Mineral Sciences Laboratories, Canada Centre for Mineral and Energy Technology		
2. Name of ILS Program: Proficiency Testing Program – Mineral Analysis Laboratories		
3. Name and title of person completing this survey: Maureen Leaver, Coordinator, Canadian Certified Reference Materials Project		
4. Contact name and title of contact person for requesting participation in the study or program: Henry Steger PTP – MAL Coordinator		
5. Address: MMSL, CANMET 555 Booth Street Ottawa, ON K1A 0G1 Canada		
Phone: (613) 992-4105	**Fax:** (613) 996-9673	**Email:** hsteger@nrcan.gc.ca

PART B: MATRICES AND PARAMETERS INVESTIGATED

Please tell us what components your quality assurance program involves. What parameters are analyzed and in which matrices (e.g. toxaphene in air, mercury in blood, etc.). What is the target concentration to be analyzed? How many samples are tested for each study? Please give an indication of the schedule of the ILS program (e.g. how many times is the program conducted each year? When do participants receive the results?). Finally, please give an indication of the cost of participation in the study.

6. Specific Parameters of Interest: toxaphene, chlordane, HCHs, congener PCBs, PCNs, radionuclides, methyl mercury, mercury, selenium, arsenic, cadmium, others (Please attach an additional page if required.)					
Parameter (e.g. trace metals, toxaphene, mercury)	**Matrices Investigated** (e.g. water, air, sediment, biota, human samples, etc.)	**Target Concentration Levels**	**# Samples/Study**	**Schedule of ILS Program (# times per year; when is the final report made?)**	**Cost for Participation in the Program**
Au, Ag, Cu, Zn, Pb, Ni, Co	**Rocks, ores**	**exploration and ore grade (ppm to per cent)**	**4 or more**	**Spls sent in October and April. Labs have one month to analyse. Report completed one month later.**	**$800 Cdn annually for Canadian Labs, $850 Cdn for non-Canadian. $50 Cdn additional fee for assessment of each additional method per metal in one set of test samples. If more than one set of same test samples, $200 Cdn for each additional set of same test sample for Canadians ($225 Cdn for non-Canadians), and $50 Cdn for each additional method of a metal .**

7. Additional Comments (e.g. how large is the program; how many labs are involved; from what geographical locations?)
8. In order to help us complete a most comprehensive listing of available ILS programs, please suggest other contacts or organizations that may provide additional information or quality assurance services.

Please add any other information or comments that you feel would add value to the above survey.

Please return to: Glynn Gomes Tel. (905) 338-2927 Fax: (905) 338-9579 Email: gomesg@globalserve.net

Questionnaire 2: National and International Interlaboratory Quality Assurance (ILS) Programs Pertinent to the Northern Contaminants Program

PART A: IDENTIFYING INFORMATION

1. Name of Organization Conducting ILS Program		
Canadian Food Inspection Agency, Winnipeg		
2. Name of ILS Program:		
Mercury Quality Assurance Program		
3. Name and title of person completing this survey:		
Erin Burns-Flett - Chemist		
4. Contact name and title of contact person for requesting participation in the study or program:		
Erin Burns-Flett - Chemist		
5. Address:		
CANADIAN FOOD INSPECTION AGENCY FRESHWATER INSTITUTE 501 UNIVERSITY CRESCENT WINNIPEG, MANITOBA R3T 2N6		
Phone: (204) 983-5077	**Fax:** (204) 984-2107	**Email:** eburnsflett@em.agr.ca

PART B: MATRICES AND PARAMETERS INVESTIGATED

Please tell us what components your quality assurance program involves. What parameters are analyzed and in which matrices (e.g. toxaphene in air, mercury in blood, etc.). What is the target concentration to be analyzed? How many samples are tested for each study? Please give an indication of the schedule of the ILS program (e.g. how many times is the program conducted each year? When do participants receive the results?). Finally, please give an indication of the cost of participation in the study.

6. Specific Parameters of Interest: toxaphene, chlordane, HCHs, congener PCBs, PCNs, radionuclides, methyl mercury, mercury, selenium, arsenic, cadmium, others (Please attach an additional page if required.)					
Parameter (e.g. trace metals, toxaphene, mercury)	**Matrices Investigated** (e.g. water, air, sediment, biota, human samples, etc.)	**Target Concentration Levels**	**# Samples/Study**	**Schedule of ILS Program (# times per year; when is the final report made?)**	**Cost for Participation in the Program**
Total mercury	fish	1. 1.00 ppm 2. 0.6 ppm 3. 0.4 ppm 4. 0.2 ppm	4 samples/study	Late September 1998 Early January 1999 Mid May 1999 Early September	No charge at present.

7. Additional Comments (e.g. how large is the program; how many labs are involved; from what geographical locations?)

Approximately 30 laboratories participate. Additional laboratories are welcome. Data can be shared if NCP wishes to evaluate the Arctic labs directly. PCBs in Fish will be done later (Nos. 28, 52, 101, 118, 138, 153, 180). We will be canning the sample for our Toronto laboratory who is responsible for maintaining this program. Would also like to do histamines/fish and shellfish toxins. We do have a histamine Quality Assurance Program and will be starting one in sulfite. Currently, we are not at all involved in shell fish toxin analysis or check samples.

8. In order to help us complete a most comprehensive listing of available ILS programs, please suggest other contacts or organizations that may provide additional information or quality assurance services.

Also available: Hg in water, sea water, sludge from:

Dr. Nicolas Bloom, Chief Scientist
Frontier Geosciences Inc.
414 Pontius North, Suite B
Seattle, Washington, U.S.A.
98109

Phone: (206) 622-6960
Fax: (206) 622-6870

Please add any other information or comments that you feel would add value to the above survey.

Please return to: Glynn Gomes Tel. (905) 338-2927 Fax: (905) 338-9579 Email: gomesg@globalserve.net

Questionnaire 2: National and International Interlaboratory Quality Assurance (ILS) Programs Pertinent to the Northern Contaminants Program

PART A: IDENTIFYING INFORMATION

1. Name of Organization Conducting ILS Program Canadian Food Inspection Agency. Ontario Operations Laboratory		
2. Name of ILS Program: Fish Check Sample Program		
3. Name and title of person completing this survey: Gerald Shum. Manager. Chemistry Laboratory		
4. Contact name and title of contact person for requesting participation in the study or program: Same as above		
5. Address: 1050 Courtneypark Drive E. Mississauga. On. L5T 2R4		
Phone: 905-795-9666 ext 227	**Fax:** 905-795-9673	**Email:** shumg@em.agr.ca

PART B: MATRICES AND PARAMETERS INVESTIGATED

Please tell us what components your quality assurance program involves. What parameters are analyzed and in which matrices (e.g. toxaphene in air, mercury in blood, etc.). What is the target concentration to be analyzed? How many samples are tested for each study? Please give an indication of the schedule of the ILS program (e.g. how many times is the program conducted each year? When do participants receive the results?). Finally, please give an indication of the cost of participation in the study.

6. Specific Parameters of Interest: toxaphene, chlordane, HCHs, congener PCBs, PCNs, radionuclides, methyl mercury, mercury, selenium, arsenic, cadmium, others (Please attach an additional page if required.)					
Parameter (e.g. trace metals, toxaphene, mercury)	**Matrices Investigated** (e.g. water, air, sediment, biota, human samples, etc.)	**Target Concentration Levels**	**# Samples/Study**	**Schedule of ILS Program (# times per year; when is the final report made?)**	**Cost for Participation in the Program**
Total PCBs, PCB congeners (7)	Fish tissue	ppm ppb	one	Once a year	Free now, cost recovery being considered

7. Additional Comments (e.g. how large is the program; how many labs are involved; from what geographical locations?)

There are 47 labs on the active mailing list which is updated yearly. Participation in the actual sample study is 15-20 labs. The program is national in scope with federal, provincial and private labs across the country participating.

8. In order to help us complete a most comprehensive listing of available ILS programs, please suggest other contacts or organizations that may provide additional information or quality assurance services.

Please add any other information or comments that you feel would add value to the above survey.

Please return to: Glynn Gomes Tel. (905) 338-2927 Fax: (905) 338-9579 Email: gomesg@globalserve.net

Questionnaire 2: National and International Interlaboratory Quality Assurance (ILS) Programs Pertinent to the Northern Contaminants Program

PART A: IDENTIFYING INFORMATION

1. Name of Organization Conducting ILS Program Centre de Toxécologie du Québec		
2. Name of ILS Program: Interlaboratory Comparison Program		
3. Name and title of person completing this survey: Allain Leblanc		
4. Contact name and title of contact person for requesting participation in the study or program: Allain Leblanc		
5. Address: CHUQ 2705 Blvd. Laurier St. Fois, Pq G1V 4G2		
Phone: 418-654-2254	**Fax:** 418-654-2148	**Email:** allain.leblanc@chuq.qc.ca

PART B: MATRICES AND PARAMETERS INVESTIGATED

Please tell us what components your quality assurance program involves. What parameters are analyzed and in which matrices (e.g. toxaphene in air, mercury in blood, etc.). What is the target concentration to be analyzed? How many samples are tested for each study? Please give an indication of the schedule of the ILS program (e.g. how many times is the program conducted each year? When do participants receive the results?). Finally, please give an indication of the cost of participation in the study.

6. Specific Parameters of Interest: toxaphene, chlordane, HCHs, congener PCBs, PCNs, radionuclides, methyl mercury, mercury, selenium, arsenic, cadmium, others (Please attach an additional page if required.)

Parameter (e.g. trace metals, toxaphene, mercury)	Matrices Investigated (e.g. water, air, sediment, biota, human samples, etc.)	Target Concentration Levels	# Samples/Study	Schedule of ILS Program (# times per year; when is the final report made?)	Cost for Participation in the Program
Lead	Whole blood	0.5 – 3 µmol/L	3 samples per run – same for all	6/year, every 2 months and one annual report for all substances	$120 (U.S.) for registration$130 (U.S.) per substance – same for all (Cu, Se, Zn in blood serum together cost $130 (essential elements)
Cd	Whole blood	0 – 100 nmol/L			
Hg (inorg., organic)	Whole blood	25 – 300 nmol/L			
Al	Blood serum	1 – 4 µmol/L			
Cu	Blood serum	~25 µmol/L			
Se	Blood serum	1 – 2 µmol/L			
Zn	Blood serum	~20 µmol/L			
Cr	Urine	20 – 100 nmol/L			
Se	Urine	0.5 – 5 µmol/L			
Pb	Urine	0.1 – 1 µmol/L			
Cu	Urine	0.5 – 5 µmol/L			
As	Urine	0.5 - 3µmol/L			
Cd	Urine	0 – 100 nmol/L			
Hg (inorg.)	Urine	0 – 100 nmol/L			

$120 US. to register.
+ $130 US for Cu, Se, Zn / blood serum
+ $130 US per test at left.

7. Additional Comments (e.g. how large is the program; how many labs are involved; from what geographical locations?)

8. In order to help us complete a most comprehensive listing of available ILS programs, please suggest other contacts or organizations that may provide additional information or quality assurance services.

Please add any other information or comments that you feel would add value to the above survey.

Please return to: Glynn Gomes Tel. (905) 338-2927 Fax: (905) 338-9579 Email: gomesg@globalserve.net

ENVIRONMENTAL
RESOURCE ASSOCIATES

October 10, 1998

Glynn Gomes
Environmental Consultant
116 River Oaks Blvd East
Oakville, ON L6H 4C5

Fax: 905-338-9579

Dear Glynn,

I am writing you in response to the questionnaire that you faxed on October 9, 1998. ERA currently has performance evaluation programs for over 40 state or regulatory agencies. These programs have been in existence for 11 years, for more specifics please turn to page 44 of the enclosed 1998 ERA catalog. Most of our products are or have been used for state or laboratory certification. ERA also has performance evaluation samples in water, soil, & oil, as well as, an extensive list of custom analytes that allow us to make virtually any type of performance evaluation sample

Many accrediting organizations will utilize ERA's InterLaB™ programs for initial or continuing certification purposes. The InterLaB™ programs include WatR™ Pollution, WatR™ Supply, Soil, and Underground Storage Tank programs. The QuiK™ Response program is usually used for remedial performance evaluation standards. ERA would suggest to the National Water Research Institute (NWRI) to administer their programs in a similar fashion. This allows the laboratories a more expedient option illustrating corrective action and allows the laboratory to re-establish their certification.

ERA would be happy to work with the NWRI in designing an interlaboratory program.The type of data collected and the information presented can at that time be addressed. The scope of the sample type and data analyses required would determine the cost of the program. We have a great deal of experience conducting custom interlaboratory studies for specific analytes and statistics, many of these studies actually coincide with our normal InterLaB™ programs.

I have enclosed ERA's 1998 catalog and an example report from the InterLaB™ WatR™ Pollution program. If you have any questions please feel free to call me, or Joel Holtz, Customer Service Representative, at 303-431-8454.

Sincerely,

Shawn Kassner

Shawn Kassner
InterLaB™ Administrator

Attachments
smk

ENVIRONMENTAL
RESOURCE ASSOCIATES

5540 MARSHALL STREET
ARVADA, COLORADO 80002
TEL (303) 431-8454
FAX (303) 421-0159
1-800-ERA-0122

SHAWN KASSNER
INTERLAB ADMINISTRATOR

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Example Report

InterLaB WatR™ Pollution
Single Blind Proficiency Testing Study

ENVIRONMENTAL RESOURCE ASSOCIATES

InterLaB WatR™ Pollution Statistical Summary

Volatiles
WP-44

Page 2

Laboratory Code: ABC Labs **Report Issued:** 8/10/98

Parameter	Reported Value (µg/l)	ERA Certified Value (µg/l)	Mean Recovery (µg/l)	n	Acceptance Limits (µg/l)	Warning Limits (µg/l)	Performance Evaluation
Toluene	34.6	36.9	35.4	5	31.9 - 39.0	33.1 - 37.8	Acceptable
1,1,1-Trichloroethane	36.1	36.4	36.3	6	25.2 - 47.3	28.9 - 43.6	Acceptable
Trichloroethylene	99.8	109	100	7	76.0 - 124	84.0 - 116	Acceptable

Definitions:

- The ERA Certified Value is equal to 100% of the parameter present in the standard as determined by gravimetric and/or volumetric measurements made during standard preparation.
- The Mean Recovery has been determined from all data reported to ERA for the parameter during this study.
- The Acceptance Limits are equal to the Mean Recovery plus and minus 3.0 standard deviations.
- The Warning Limits are equal to the Mean Recovery plus and minus 2.0 standard deviations.
- The Performance Evaluation:
  - Acceptable = Reported Result falls within the Warning Limits. $\bar{x} \pm 2s$
  - Not Acceptable = Reported Result falls outside of the Acceptance Limits. $> 3s$
  - Check for Error = Reported Result falls within the Acceptance Limits and outside of the Warning Limits.
- n = number of data points used to calculate Mean Recovery, Acceptance and Warning Limits.

Additional Comments:

ENVIRONMENTAL RESOURCE ASSOCIATES

InterLaB WatR™ Pollution
Statistical Summary

BNAs
WP-44

Laboratory Code: ABC Labs **Report Issued:** 8/10/98

Parameter	Reported Value (µg/l)	ERA Certified Value (µg/l)	Mean Recovery (µg/l)	n	Acceptance Limits (µg/l)	Warning Limits (µg/l)	Performance Evaluation
Acenaphthene	52.5	65.7	51.8	6	28.6 - 74.9	36.3 - 67.2	Acceptable
Acenaphthylene	11.2	12.4	10.5	4	2.73 - 18.3	5.32 - 15.7	Acceptable
Anthracene	145	141	140	6	84.1 - 196	103 - 177	Acceptable
Butylbenzylphthalate	142	175	136	5	D.L. - 291	33.3 - 240	Acceptable
bis(2-Chloroethyl)ether	119	161	118	5	30.6 - 205	59.6 - 176	Acceptable
Chrysene	19.5	20.7	18.7	5	11.0 - 26.4	13.6 - 23.9	Acceptable
Dibenzofuran	63.5	79.2	62.1	6	38.2 - 86.1	46.2 - 78.1	Acceptable
Di-n-butylphthalate	87.1	111	86.9	6	10.2 - 164	35.8 - 138	Acceptable
1,2-Dichlorobenzene	97.5	157	96.6	6	D.L. - 215	17.4 - 176	Acceptable
1,3-Dichlorobenzene	8.75	19.7	9.74	3	D.L. - 23.7	0.417 - 19.1	Acceptable
2,4-Dinitrotoluene	95.6	125	96.8	6	64.6 - 129	75.3 - 118	Acceptable
bis(2-Ethylhexyl)phthalate	24.8	29.6	25.3	6	5.75 - 44.9	12.3 - 38.4	Acceptable
Fluoranthene	23.5	28.1	23.2	6	11.6 - 34.8	15.4 - 30.9	Acceptable
Naphthalene	43.6	59.9	42.5	6	9.75 - 75.3	20.7 - 64.4	Acceptable
Pyrene	55.8	66.4	57.1	5	10.9 - 103	26.3 - 87.8	Acceptable
1,2,4-Trichlorobenzene	45.6	66.8	41.3	6	9.82 - 72.7	20.3 - 62.2	Acceptable

BNAs
WP-44

Page 2

Laboratory Code: ABC Labs

Parameter	Reported Value (µg/l)	ERA Certified Value (µg/l)	Mean Recovery (µg/l)	n	Acceptance Limits (µg/l)	Warning Limits (µg/l)	Performance Evaluation
2,4-Dichlorophenol	48.9	64.4	47.4	5	30.4 - 64.4	36.1 - 58.7	Acceptable
2-Methylphenol	98.3	158	94.8	5	35.0 - 155	54.9 - 135	Acceptable
3-Methylphenol	49.8	83.9	48.1	4	17.5 - 78.7	27.7 - 68.5	Acceptable
2-Nitrophenol	88.9	123	87.5	6	49.6 - 125	62.2 - 113	Acceptable
Pentachlorophenol	65.4	84.7	63.2	5	18.3 - 108	33.3 - 93.1	Acceptable
Phenol	45.8	85.0	34.8	6	D.L. - 94.6	D.L. - 74.7	Acceptable
2,4,6,-Trichlorophenol	32.6	41.1	29.7	6	0.254 - 59.1	10.1 - 49.3	Acceptable

Definitions:

- The ERA Certified Value is equal to 100% of the parameter present in the standard as determined by gravimetric and/or volumetric measurements made during standard preparation.
- The Mean Recovery has been determined from all data reported to ERA for the parameter during this study.
- The Acceptance Limits are equal to the Mean Recovery plus and minus 3.0 standard deviations.
- The Warning Limits are equal to the Mean Recovery plus and minus 2.0 standard deviations.
- The Performance Evaluation:

  Acceptable = Reported Result falls within the Warning Limits.

  Not Acceptable = Reported Result falls outside of the Acceptance Limits.

  Check for Error = Reported Result falls within the Acceptance Limits and outside of the Warning Limits.
- n = number of data points used to calculate Mean Recovery, Acceptance and Warning Limits.

Additional Comments:

D.L. - Detection Limit

ENVIRONMENTAL RESOURCE ASSOCIATES

InterLaB WatR™ Pollution Statistical Summary

Demand
WP-44

Laboratory Code: ABC Labs **Report Issued:** 8/10/98

Parameter	Reported Value (mg/l)	ERA Certified Value (mg/l)	Mean Recovery (mg/l)	n	Acceptance Limits (mg/l)	Warning Limits (mg/l)	Performance Evaluation
BOD	20	52.6	51.0	23	23.5 - 78.6	32.7 - 69.4	Not Acceptable
CBOD	18	45.6	43.3	9	16.6 - 70.0	25.5 - 61.1	Check for Error
COD	95	87.6	90.3	18	56.5 - 124	67.7 - 113	Acceptable
TOC	32.6	34.9	35.0	13	30.2 - 39.7	31.8 - 38.1	Acceptable
total phosphorus as P	5.43	8.36	8.03	17	3.91 - 12.2	5.28 - 10.8	Acceptable
TKN as N	5.32	5.29	5.31	10	2.31 - 8.31	3.31 - 7.31	Acceptable

Definitions:

- The ERA Certified Value is equal to 100% of the parameter present in the standard as determined by gravimetric and/or volumetric measurements made during standard preparation.
- The Mean Recovery has been determined from all data reported to ERA for the parameter during this study.
- The Acceptance Limits are equal to the Mean Recovery plus and minus 3.0 standard deviations.
- The Warning Limits are equal to the Mean Recovery plus and minus 2.0 standard deviations.
- The Performance Evaluation:

  Acceptable = Reported Result falls within the Warning Limits.

  Not Acceptable = Reported Result falls outside of the Acceptance Limits.

  Check for Error = Reported Result falls within the Acceptance Limits and outside of the Warning Limits.
- n = number of data points used to calculate Mean Recovery, Acceptance and Warning Limits.

Additional Comments:

ENVIRONMENTAL RESOURCE ASSOCIATES

InterLaB WatR™ Pollution Statistical Summary

Hardness
WP-44

Laboratory Code: ABC Labs **Report Issued:** 8/10/98

Parameter	Reported Value (mg/l)	ERA Certified Value (mg/l)	Mean Recovery (mg/l)	n	Acceptance Limits (mg/l)	Warning Limits (mg/l)	Performance Evaluation
total suspended solids	28	34.0	31.7	32	20.3 - 43.1	24.1 - 39.3	Acceptable
calcium	88	90.5	92.2	10	81.6 - 103	85.1 - 99.2	Acceptable
magnesium	44	41.4	43.1	12	37.2 - 49.0	39.2 - 47.0	Acceptable
calcium hardness as CaCO3	220	226	231	10	203 - 258	213 - 249	Acceptable
total hardness as CaCO3	400	397	399	17	337 - 461	358 - 440	Acceptable

Definitions:

- **The ERA Certified Value is equal to 100% of the parameter present in the standard as determined by gravimetric and/or volumetric measurements made during standard preparation.**
- **The Mean Recovery has been determined from all data reported to ERA for the parameter during this study.**
- **The Acceptance Limits are equal to the Mean Recovery plus and minus 3.0 standard deviations.**
- **The Warning Limits are equal to the Mean Recovery plus and minus 2.0 standard deviations.**
- **The Performance Evaluation:**

  Acceptable = Reported Result falls within the Warning Limits.

  Not Acceptable = Reported Result falls outside of the Acceptance Limits.

  Check for Error = Reported Result falls within the Acceptance Limits and outside of the Warning Limits.
- **n = number of data points used to calculate Mean Recovery, Acceptance and Warning Limits.**

Additional Comments:

ENVIRONMENTAL RESOURCE ASSOCIATES

InterLaB WatR™ Pollution Statistical Summary

Minerals
WP-44

Laboratory Code: ABC Labs **Report Issued:** 8/10/98

Parameter	Reported Value (mg/l)	ERA Certified Value (mg/l)	Mean Recovery (mg/l)	n	Acceptance Limits (mg/l)	Warning Limits (mg/l)	Performance Evaluation
total solids at 105°C	812	810	806	14	604 - 1010	671 - 942	Acceptable
total dissolved solids at 180°C	812	810	784	17	512 - 1060	603 - 966	Acceptable
conductivity at 25°C	913	925	921	17	806 - 1030	844 - 997	Acceptable
alkalinity as CaCO3	206	203	205	17	175 - 236	185 - 226	Acceptable
chloride	91.3	91.2	96.0	17	79.0 - 113	84.7 - 107	Acceptable
fluoride	17.2	16.7	17.0	12	13.2 - 20.7	14.5 - 19.5	Acceptable
sulfate	68.9	69.2	72.0	9	56.7 - 87.4	61.8 - 82.3	Acceptable
potassium	85.8	90.7	89.9	9	59.6 - 120	69.7 - 110	Acceptable
sodium	166	153	158	10	129 - 186	138 - 177	Acceptable
pH	9.26	9.16	9.08	31	8.59 - 9.58	8.76 - 9.41	Acceptable

Definitions:

- The ERA Certified Value is equal to 100% of the parameter present in the standard as determined by gravimetric and/or volumetric measurements made during standard preparation.
- The Mean Recovery has been determined from all data reported to ERA for the parameter during this study.
- The Acceptance Limits are equal to the Mean Recovery plus and minus 3.0 standard deviations.
- The Warning Limits are equal to the Mean Recovery plus and minus 2.0 standard deviations.
- The Performance Evaluation:

  Acceptable = Reported Result falls within the Warning Limits.

  Not Acceptable = Reported Result falls outside of the Acceptance Limits.

  Check for Error = Reported Result falls within the Acceptance Limits and outside of the Warning Limits.
- n = number of data points used to calculate Mean Recovery, Acceptance and Warning Limits.

Additional Comments:

ENVIRONMENTAL RESOURCE ASSOCIATES

InterLaB WatR™ Pollution
Statistical Summary

Volatiles
WP-44

Laboratory Code: ABC Labs

Report Issued: 8/10/98

Parameter	Reported Value (µg/l)	ERA Certified Value (µg/l)	Mean Recovery (µg/l)	n	Acceptance Limits (µg/l)	Warning Limits (µg/l)	Performance Evaluation
Benzene	80.5	85.6	82.5	5	71.0 - 94.0	74.8 - 90.2	Acceptable
Bromodichloromethane	14.7	16.0	16.7	5	12.1 - 21.4	13.7 - 19.8	Acceptable
Bromoform	94.8	108	99.3	5	70.7 - 128	80.2 - 118	Acceptable
Carbon tetrachloride	13.5	15.9	14.7	6	9.27 - 20.1	11.1 - 18.3	Acceptable
Chlorobenzene	107	121	107	6	74.2 - 141	85.3 - 129	Acceptable
Chlorodibromomethane	92.8	96.8	93.6	6	70.8 - 116	78.4 - 109	Acceptable
Chloroform	63.2	63.5	64.0	6	47.1 - 80.9	52.8 - 75.3	Acceptable
1,2-Dichlorobenzene	55.2	57.2	56.3	5	50.2 - 62.4	52.2 - 60.4	Acceptable
1,3-Dichlorobenzene	46.8	49.2	47.7	5	42.0 - 53.3	43.9 - 51.4	Acceptable
1,4-Dichlorobenzene	50.7	52.4	50.7	5	45.3 - 56.1	47.1 - 54.3	Acceptable
1,2-Dichloroethane	24.1	25.2	26.1	6	22.8 - 29.5	23.9 - 28.4	Acceptable
1,1-Dichloroethylene	130	138	132	3	90.5 - 173	104 - 159	Acceptable
1,2-Dichloropropane	9.02	8.81	9.23	6	6.43 - 12.0	7.36 - 11.1	Acceptable
Ethylbenzene	104	118	109	5	86.0 - 132	93.6 - 124	Acceptable
Methylene chloride	23.6	24.6	25.8	6	16.1 - 35.5	19.3 - 32.3	Acceptable
4-Methyl-2-pentanone (MIBK)	76.4	80.4	77.2	4	66.7 - 87.6	70.2 - 84.1	Acceptable
Styrene	59.6	63.1	60.0	5	54.8 - 65.2	56.6 - 63.5	Acceptable
Tetrachloroethylene	72.9	84.2	73.2	5	63.1 - 83.3	66.5 - 79.9	Acceptable

Example Report

InterLaB™ Scoring and Ranking Reports

ENVIRONMENTAL
RESOURCE ASSOCIATES

InterLaB™ Score
and
Overall Assessment
Study: WP-44

Laboratory Code: ABC Labs **Report Issued:** 8/10/98

Number of Acceptable Analytes	Number of Reported Analytes	InterLaB™ Score	Overall Assessment
65	67	97.0%	Excellent

Definitions:

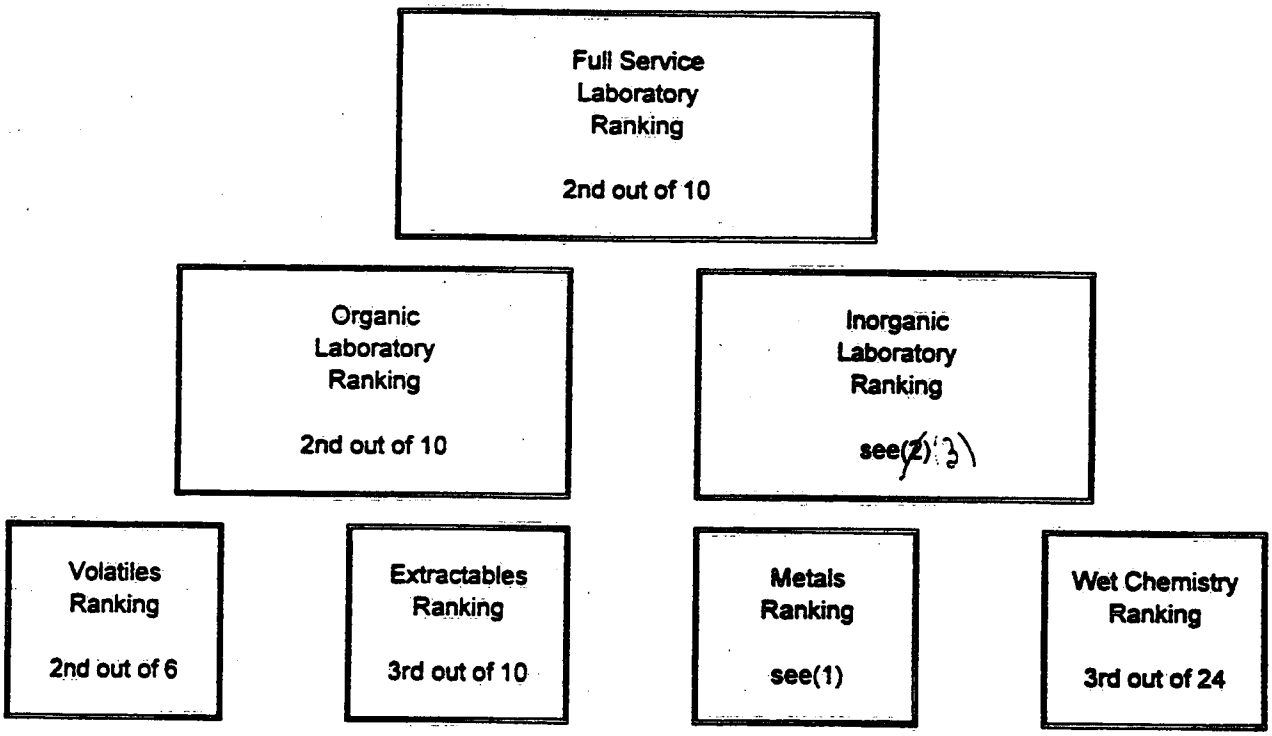
- The Number of Acceptable Analytes is equal to any reported values that resulted in an acceptable performance evaluation for your laboratory. An acceptable performance evaluation falls within the the warning limits. The warning limits are equal to the mean recovery plus and minus 2.0 standard deviations. This is equivalent to the 95% confidence interval.
- The Number of Reported Analytes is equal to any values reported during this study for your laboratory, including any false positive analytes reported.
- The InterLaB™ Score is equal to the sum of the Number of Acceptable Analytes divided by the total Number of Reported Analytes.
- The Overall Assessment:

  Excellent = InterLaB™ Score falls within 95.0% and 100%.
  Very Good = InterLaB™ Score falls within 85.0% and 94.9%.
  Good = InterLaB™ Score falls within 75.0% and 84.9%.
  Acceptable = InterLaB™ Score falls within 65.0% and 74.9%.
  Needs Improvement = InterLaB™ Score is equal to or below 64.9%.

ENVIRONMENTAL
RESOURCE ASSOCIATES

InterLaB WatR™ Pollution Laboratory Ranking WP-44

Customer Code: ABC Labs



Definitions:

(1) A total of at least 7 analyses must be reported to be ranked in each of the Volatiles, Extractables, Metals and Wet Chemistry categories.
(2) A laboratory must be ranked in the Volatiles and Extractables categories to be ranked in the Organic category.
(3) A laboratory must be ranked in the Metals and Wet Chemistry categories to be ranked in the Inorganic category.
(4) A laboratory must be ranked in at least one of the Volatiles or Extractables categories and in at least one of the Metals or Wet Chemistry categories to be ranked in the Full Service category.

Questionnaire 2: National and International Interlaboratory Quality Assurance (ILS) Programs Pertinent to the Northern Contaminants Program

PART A: IDENTIFYING INFORMATION

1. Name of Organization Conducting ILS Program Frontier Geosciences Inc.		
2. Name of ILS Program: Do not conduct ILS programs. at present, but have in the past. See Comments in Q.#7.		
3. Name and title of person completing this survey: Efrosini Tsalkitzis		
4. Contact name and title of contact person for requesting participation in the study or program: Efrosini Tsalkitzis (Dr. Nicolas Bloom, Chief Scientist)		
5. Address: Frontier Geosciences Inc. 414 Pontius Avenue North Suite B Seattle, WA USA 98109		
Phone: (206) 622-6960	**Fax:** (206) 622-6870	**Email:** effiet@frontier.wa.com

PART B: MATRICES AND PARAMETERS INVESTIGATED

Please tell us what components your quality assurance program involves. What parameters are analyzed and in which matrices (e.g. toxaphene in air, mercury in blood, etc.). What is the target concentration to be analyzed? How many samples are tested for each study? Please give an indication of the schedule of the ILS program (e.g. how many times is the program conducted each year? When do participants receive the results?). Finally, please give an indication of the cost of participation in the study.

6. Specific Parameters of Interest: toxaphene, chlordane, HCHs, congener PCBs, PCNs, radionuclides, methyl mercury, mercury, selenium, arsenic, cadmium, others (Please attach an additional page if required.)					
Parameter (e.g. trace metals, toxaphene, mercury)	**Matrices Investigated** (e.g. water, air, sediment, biota, human samples, etc.)	**Target Concentration Levels**	**# Samples/Study**	**Schedule of ILS Program (# times per year; when is the final report made?)**	**Cost for Participation in the Program**
N/A					

7. Additional Comments (e.g. how large is the program; how many labs are involved; from what geographical locations?)

Frontier Geoscience Inc. has conducted ILS programs in the past; however, there are no current programs. They are capable of custom designing an ILS program for the NCP with custom parameters, matrices, and schedules. Frontier Geosciences works in collaboration with Axys Analytical Services (Sydney, B.C.). Matrices routinely investigated: freshwater, saltwater, porewater, soil, sediment, sewage sludge, various biota (e.g. zooplankton, fish, mammals, mussels, etc.). Special matrices will likely be done upon request. Parameters include: metals (e.g. mercury species, trace metal species) and organics (e.g. pesticides, dioxins/furans, PCB congeners). Past ILS programs have involved 1 sample per study where the laboratories have conducted the analyses in triplicate. However, the numbers of samples per study can be customized. The schedule of the programs (i.e. number of studies per year) can also be customized.

8. In order to help us complete a most comprehensive listing of available ILS programs, please suggest other contacts or organizations that may provide additional information or quality assurance services.

Please add any other information or comments that you feel would add value to the above survey.

Please return to: Glynn Gomes Tel: (905) 338-2927 Fax: (905) 338-9579 Email: gomesg@globalserve.net

FRONTIER GEOSCIENCES INC.
ENVIRONMENTAL RESEARCH & SPECIALTY ANALYTICAL LABORATORY
(206) 622-6960 • fax: (206) 622-6870
E-MAIL: INFO@FRONTIER.WA.COM
414 PONTIUS NORTH • SEATTLE, WA 98109

Enclosed is Frontier Geosciences' list of 1998 method detection limits (MDLs) and general pricing information. List prices in the booklet apply to small sample sets in simple matrices, and can be used to estimate costs on bigger projects. However, on larger, more complex, or ongoing projects, it is essential to obtain an accurate quote from the project manager, after discussion of relevant specifics (e.g., number of samples, delivery schedule, QA level, etc.). Each project has specific and unique requirements, and Frontier scientists are happy to help you design your research to provide the most information for the best value.

The following is a list of Frontier senior staff members, their areas of expertise, and their e-mail addresses. If you have a project in mind, please give us the opportunity to present our capabilities and qualifications.

Nicolas S Bloom	**Complex Problems/Methods Development**	**Nicolasb@Frontier.wa.com**
Michelle Gauthier	**Trace Metals Analytical Chemistry**	**MichelleG@Frontier.wa.com**
Ed Geiger	**President, Business Contact**	**EddieG@Frontier.wa.com**
Beverly Heaphey	**Quality Assurance / Quality Control**	**BeverlyH@frontier.wa.com**
Eric M. Prestbo	**Atmospheric Trace Metals**	**EricP@Frontier.wa.com**
Ralph R. Turner	**Environmental Mercury**	**RalphT@Frontier.wa.com**

Prices agreed upon in previous written contracts remain, of course, in effect for the duration of the contract. For work being conducted without written contracts our new prices will go into effect as of March 1, 1998, unless other agreements have been made with a Frontier Geosciences' project manager.

In addition to helping you tailor our analytical services to your particular needs, Frontier has other programs designed to provide added value. For example, we deduct 5% of the cost of your project if you establish a basic ordering agreement (BOA) with us. Other discounts may be available based on quantity, repeat business, and other factors (please contact Ed Geiger for details).

Frontier is committed to producing the highest quality data, while demonstrating professionalism in service and scientific integrity. We look forward to working with you.

Item Codes

FRONTIER GEOSCIENCES

Item	Analyses with Digestion and Combinations	Type	Price
AD01	Total Hg in water analysis (method 1631) w/Digestion (1-5% BrCl, room temp	Service	$ 50
AD02	Total Hg in Tissue analysis (method 1631) w/Digestion (HNO3/H2SO4, hot pl	Service	$ 75
AD10	MMHg in water analysis per method 1630 w/Digestion/Distillation	Service	$ 170
AD12	MMHg analysis per Method 1630 w/distillation for solids	Service	$ 180
AD14	MMHg analysis per Method 1630 w/MeCL2 extraction for solids	Service	$ 190
AD16	MMHg analysis per method 1630 w/Digestion in low level solids	Service	$ 180
AD18	MMHg analysis per method 1630 w/Digestion in tissue (KOH/methanol diges	Service	$ 170
AD20	Inorganic Hg(II) in water	Service	
AD25	Inorganic Hg(II) in tissue, reported on a wet weight basis	Service	
AD30	Dimethyl Hg in water	Service	
AD35	Dimethyl Hg in tissue, reported on a wet weight basis	Service	
AD38	Dimethyl Hg in sediment/soil, reported on a dry weight basis	Service	
AD40	Elemental Hg in Water	Service	
AD45	Elemental Hg in sediment/soil	Service	
AD50	NADP Mercury Deposition Network (MDN)	Service	$ 158
AD55	NADP Methyl Hg in MDN rain	Service	$ 150
AD60	FLUEGAS Total, Particulate Hg , Gaseous Hg^0 and Hg(II) (S-OH Method an	Service	$ 640

Item	Miscellaneous	Type	Price
M05	Tubing Cleaning	Service	
M10	Bottle Cleaning	Service	
M15	Equipment Rental	Rental	
M20	Compositing	Service	
M30	1 gram of gold quartz sand	Non-inventor	$25
M40	Gold Sand Trap Manufacture for Air Sampling or Method 1631 (per trap)	non-inventor	$ 100

Item	Preparation	Type	Price
P600	Filtration	Service	$ 35
P605	Tissue Homogenization - small	Service	$ 35
P610	Tissue Homogenization - medium	Service	$ 50
P615	Filter Pack Prep for Particulate and Reactive Gaseous Hg (IX membrane)	Service	$ 35
P620	Filter Pack Prep for Particulate Hg (EPA Rec. Method IO-5)	Service	$ 20
P625	Gold Train Prep for Total Gaseous Hg in Air (EPA Rec. Method IO-5)	Service	$ 20
P630	Coal Pulverization for Digestion	Service	$ 45
P640	Iodated Carbon Trap Preparation for Fluegas or Air Sampling	Service	$ 15
P645	KCl Train Preparation for Fluegas Hg Speciation Sampling	Service	$ 50
P650	Quartz Probe with Quartz Wool Filter Preparation for Fluegas Sampling	Service	$ 30
P655	Mini-Quartz Probe with Quartz Wool Filter Prep for Fluegas Sampling	Service	$ 15

Item	AL Group - Shipping & Surcharges	Type	Price
S405	Shipping	Service	at cost
S410	Surcharge for 1-2 day turn-around	Service	100%
S415	Surcharge for 5 calendar day turn-around	Service	60%
S420	Surcharge for 7 calendar day turn-around	Service	45%
S425	Surcharge for 14 day turn-around	Service	[illegible]
S430	Surcharge for 21 calendar day turn-around	Service	25%
S440	Surcharge for High Level QA (approximately EPA level IV)	Service	30%

Item	RC Group - Consulting & RC Group Specific	Type	Price
RE05	MMHg analysis per impinger (Direct Ethylation - Air Samples)	Service	$ 90
RE10	Dimethyl Hg in Air (Carbotrap Collection)	Service	$ 70
RE15	Total Dissolved Gaseous Hg in Water (Hg^0)	Service	$ 160
RE20	Dimethyl Hg in Water (Purging onto Carbotrap)	Service	$ 135
RE25	Total As by HG-AFS (including digestion)	Service	$ 75
RE30	Selenium Speciation by IC-HG-AFS	Service	
RE35	Digestion for AFS analysis	Service	$ 20
RE40	Digestion for Gaseous Hg(II) collected on Exchange (IX) membrane	Service	$ 25
RE45	Digestion for Particulate Hg Collected on Air Filter (Method IO-5)	Service	$ 65
RE50	Digestion for Gaseous Hg(II) collected on KCl Denuder or Trap	Service	$ 25
RE55	Digestion for Dry Deposition on IX membrane	Service	$ 45
RE60	Impinger train (3) for MMHg in Air sampling Preparation	Service	$ 100
RE65	Carbotrap Prep for DMHg Air Sampling	Service	$ 40
RE70	KCl Denuder (or packed column) Prep for Hg(II) in Air	Service	$ 45
RE75	Hg Bulk Atmospheric Deposition - Prep of Sampler	Service	$ 50
RE80	Hg Dry Only Atmospheric Deposition Sampler Prep (IX Membrane)	Service	$ 50
RHBloom	Chargeable hours worked by Nicolas Bloom	Service	
RHBrunet	Chargeable hours worked by Bob Brunette	Service	
RHEffie	Chargeable hours worked by Effie	Service	
RHPrestb	Chargeable hours worked by Eric M. Prestbo	Service	
RHTurner	Hours chargeable by Ralph Turner	Service	
RHWallsc	Chargeable hours worked by Dirk Wallschläger	Service	

Item Code:

FRONTIER GEOSCIENCES
ENVIRONMENTAL RESEARCH CORPORATION
414 Pontius Road • Seattle, WA 98109
(206) 622-6063 • fax (206) 622-6870

Item	Analysis	Type	Price
A05	Total Hg analysis per method 1631	Service	$ 30
A10	MMHg analysis using method 1630	Service	$ 125
A15	Total Solids (to report on dry weight basis)	Service	$ 10
A20	ICP-MS - 1st element per sample	Service	$ 25
A25	ICP-MS - each additional element	Service	$ 15
A902	ICP-MS Analysis for 2 elements	Group	$ 40
A903	ICP-MS Analysis for 3 elements	Group	$ 55
A904	ICP-MS Analysis for 4 elements	Group	$ 70
A905	ICP-MS Analysis for 5 elements	Group	$ 85
A906	ICP-MS Analysis for 6 elements	Group	$ 100
A907	ICP-MS Analysis for 7 elements	Group	$ 115
A908	ICP-MS Analysis for 8 elements	Group	$ 130
A909	ICP-MS Analysis for 9 elements	Group	$ 145
A910	ICP-MS Analysis for 10 elements	Group	$ 160
A27	Acid Volatile Sulfide (AVS)—does not include SEM Analysis	Service	280
A30	GFAAS per element per sample	Service	$ 25
A35	AFS, total Inorganic As	Service	$ 55
A40	AFS, Total AS (includes Digestion AD160)	Service	$ 75
A42	Total Suspended Solids (TSS)	Service	$ 35
A44	Loss on ignition (aka TVS)	Service	$ 15
A52	As(III) by HG-CT-AAS	Service	$ 80
A54	Total Inorganic (T.I.) As by HG-CT-AAS	Service	$ 80
A56	MeAs and Me2As by HG-CT-AAS	Service	$ 80
A58	Se(IV) by HG-AFS	Service	$ 55
A60	Total Inorganic (T.I.) Se by HG-AFS	Service	$ 75
A62	Total Se by HG-AFS	Service	$ 75
A64	Dissolved Fe (total) by color	Service	$ 25
A66	Dissolved Fe(II) by color	Service	$ 25
A68	Cr(VI) by color—diss.	Service	$ 40
A70	Total Fe by color (including Digestion AD160)	Service	$ 45
A75	Total Gaseous Hg on Gold Trap (EPA recommended Method IO-5)	Service	$ 30
A80	pH in Waters	Service	$ 10
A85	pH in Soils by Slurry Method	Service	$ 20

Item	Sub-Contracted Out	Type	Price
C80	Percent gravel, sand, silt, clay	Service	
C81	Total organic carbon	Service	
C82	Dissolved organic carbon	Service	
C83	Alkalinity	Service	
C84	Fish homogenization	Service	
C85	Sulfate	Service	
C86	Sulfide	Service	

Item	Digestions	Type	Price
D102	Digestion for Total Hg in water (1-5% BrCl, room temp)	Service	$ 20
D103	Digestion for Total Hg in tissue (HNO3/H2SO4, hotplate)	Service	$ 45
D104	Digestion Total Hg in conc. HNO3 tissue (shared with other analysis)	Service	$ 20
D105	Digestion for Total Hg on Sorbent Trap (Iodated Carbon or KCl)	Service	$ 25
D106	Digestion for Total Hg in Flyash (HNO3/H2SO4, hotplate)	Service	$ 45
D107	Digestion for Total Hg in soil/sediment/coal (cold aqua regia)	Service	$ 45
D108	Digestion for Total Hg in oil (BrCl extraction, hot)	Service	$ 75
D109	Digestion for Total Hg in coal (HNO3/H2SO4/HClO4)	Service	$ 75
D110	Digestion for MMHg in water (distillation)	Service	$ 45
D115	Digestion for MMHg in low-level solids such as plants, etc. (distillation)	Service	$ 55
D120	Digestion for MMHg in tissue (KOH/methanol digestion)	Service	$ 45
D125	Digestion for MMHg in solids such as soils, sediments, etc. (MeCl2 extract...	Service	$ 65
D130	Ultra-violet photo-oxidation	Service	$ 50
D135	Ultra-clean evapoconcentration	Service	$ 50
D145	TR Closed-Vessel Oven Digest	Service	$ 20
D150	Tissue Digestion (Conc. HNO3)	Service	$ 50
D155	Soil HF/HNO3 bomb Digestion	Service	$ 60
D160	Li Metaborate Fusion	Service	$ 90
D165	APDC or FeOH Coprecipitation	Service	$ 80
D170	Pseudo-TCLP leach (solid wastes)—does not exactly follow EPA shaking pro	Service	$ 165
D175	Se Speciation leach for soils	Service	$ 50
D180	As Speciation leach for soils	Service	$ 100
D185	Digestion for Hg(II) collected on Exchange (IX) membrane	Service	$ 25
D190	Digestion for Particulate Hg on Collected on Air Filter (Method IO-5)	Service	$ 25

Questionnaire 2: National and International Interlaboratory Quality Assurance (ILS) Programs Pertinent to the Northern Contaminants Program

PART A: IDENTIFYING INFORMATION

1. Name of Organization Conducting ILS Program International Atmospheric Deposition Network Steering Committee		
2. Name of ILS Program: International Atmospheric Deposition Network QAPP		
3. Name and title of person completing this survey: Sylvia Cussion/William Strachan		
4. Contact name and title of contact person for requesting participation in the study or program: Sylvia Cussion, interlaboratory Study Scientist		
5. Address: Ministry of the Environment 125 Resources Road Toronto, ON M9P 3V6		
Phone: 416-235-5842	**Fax:** 416-235-6312	**Email:** cussiosy@ene.gov.on.ca

PART B: MATRICES AND PARAMETERS INVESTIGATED

Please tell us what components your quality assurance program involves. What parameters are analyzed and in which matrices (e.g. toxaphene in air, mercury in blood, etc.). What is the target concentration to be analyzed? How many samples are tested for each study? Please give an indication of the schedule of the ILS program (e.g. how many times is the program conducted each year? When do participants receive the results?). Finally, please give an indication of the cost of participation in the study.

6. Specific Parameters of Interest: toxaphene, chlordane, HCHs, congener PCBs, PCNs, radionuclides, methyl mercury, mercury, selenium, arsenic, cadmium, others (Please attach an additional page if required.)					
Parameter (e.g. trace metals, toxaphene, mercury)	**Matrices Investigated** (e.g. water, air, sediment, biota, human samples, etc.)	**Target Concentration Levels**	**# Samples/Study**	**Schedule of ILS Program (# times per year; when is the final report made?)**	**Cost for Participation in the Program**
PAHs	solvents	?	?	On-going but depends on funding	See below
Organochlorines *	solvents	?	?		See below
Some PCB congeners	solvents	?	?		See below
Metals	water	?	?		See below
* includes chlordanes					

7. Additional Comments (e.g. how large is the program; how many labs are involved; from what geographical locations?)

Sylvia Cussion implements the QA program. Currently she is on maternity leave and is expected back in March 1999. The program is in the process of being revised. The program has not been conducted this year. However, it will probably resume in March 1999. The program is restricted to the following organizations, all part of IADN. For them, the service is free (funded by the Northern Contaminants Program).

1. 1 laboratory contracted by the EPA in the United States
2. William Strachan – Melanie Nielson (precipitation)
3. Ray Hoff - Ken Brice (air)
4. Ontario Ministry of Environment laboratory
5. NLET/Ontario Region

8. In order to help us complete a most comprehensive listing of available ILS programs, please suggest other contacts or organizations that may provide additional information or quality assurance services.

- William Strachan, Chief, NWRI, ENVIRONMENT CANADA
  Atmospheric Contaminant Impacts

  867 Lakeshore Road
  PO Box: 5050
  Burlington, Ontario L7R 4A6
  Tel. (905) 336-4775
  Fax (905) 336-4972

- Debbie Burniston, Chemical Technician, NWRI, ENVIRONMENT CANADA
  Atmospheric Contaminant Impacts

  Tel. (905) 336-6025
  Fax (905) 336-4972

- Ray Hoff, Atmospheric Environment Service, ENVIRONMENT CANADA/Coordinator of IADN: Tel. 705-458-3310 Fax. 705-458-3301

Please add any other information or comments that you feel would add value to the above survey.

Please return to: Glynn Gomes Tel. (905) 338-2927 Fax: (905) 338-9579 Email: gomesg@globalserve.net

Questionnaire 2: National and International Interlaboratory Quality Assurance (ILS) Programs Pertinent to the Northern Contaminants Program

PART A: IDENTIFYING INFORMATION

1. Name of Organization Conducting ILS Program International Atomic Energy Agency		
2. Name of ILS Program: IAEA Intercomparison Exercises planned for 1998/1999		
3. Name and title of person completing this survey: from catalogue, "AQCS 1998/1999 Intercomparison Runs/Reference Materials"		
4. Contact name and title of contact person for requesting participation in the study or program: Mr. Radecki, Analytical Quality Control Services		
5. Address: International Atomic Energy Agency Analytical Quality Control Services Agency's Laboratories Seibersdorf P.O. Box 100 A- 1400 Vienna, Austria		
Phone: (+43) 1-2060-26006	**Fax**: (+43) 1-2060-26007	**Email**: aqcs@iaea.org

PART B: MATRICES AND PARAMETERS INVESTIGATED

Please tell us what components your quality assurance program involves. What parameters are analyzed and in which matrices (e.g. toxaphene in air, mercury in blood, etc.). What is the target concentration to be analyzed? How many samples are tested for each study? Please give an indication of the schedule of the ILS program (e.g. how many times is the program conducted each year? When do participants receive the results?). Finally, please give an indication of the cost of participation in the study.

6. Specific Parameters of Interest: toxaphene, chlordane, HCHs, congener PCBs, PCNs, radionuclides, methyl mercury, mercury, selenium, arsenic, cadmium, others (Please attach an additional page if required.)					
Parameter (e.g. trace metals, toxaphene, mercury)	**Matrices Investigated (e.g. water, air, sediment, biota, human samples, etc.)**	**Target Concentration Levels**	**# Samples/Study**	**Schedule of ILS Program (# times per year; when is the final report made?)**	**Cost for Participation in the Program**
See catalogue: pp. 123-132. "IAEA Intercomparison Exercises planned for 1998/1999"; see additional comments	See catalogue: pp. 123-132. "IAEA Intercomparison Exercises planned for 1998/1999"; see additional comments	Environmental Levels			No charge; however a handling charge of $50 (U.S.) is charged in case intercomparison results are not sent back before set deadlines (typically 3 to 4 months)

7. Additional Comments (e.g. how large is the program; how many labs are involved; from what geographical locations?)
Inter comparisons are still planned for the next few years; however, these will be phased out in favour of proficiency testing.

(See catalogue) There are four intercomparison exercises:

1. Radionuclide Determinations in Samples of Marine Origin (p. 125-126; Organizer: Mr. P. P. Povinec, IAEA Marine Environmental Laboratory, B. P. 800, MC 98012 Monaco Cedex, Monaco)
2. Organic Micro-Contaminants, Methyl Mercury and Trace, Minor and Major Element Determinations in Samples of Marine Origin (p. 127-128; Organizer: Mr. Fernando P. Carvalho, Marine Environmental Studies Laboratories, IAEA Marine Environmental Laboratory, B. P. 800, MC 98012 Monaco Cedex, Monaco)
3. Radionuclide and Trace, Minor and Major Element Determinations in Samples of Terrestrial Origin (p. 129-130; Organizer: Mr. K. Burns INTERNATIOAL ATOMIC ENERGY AGENCY, Analytical Quality Control Services, Agency's Laboratories Seibersdorf, P.O. Box 100, A-1400 Vienna, Austria)
4. Isotope Ratio Determination (p. 131-132; Organizer: Mr. M. Groening, INTERNATIONAL ATOMIC ENERGY AGENCY, Isotope Hydrology Section, P.O. Box 100, A-1400 Vienna, Austria)

8. In order to help us complete a most comprehensive listing of available ILS programs, please suggest other contacts or organizations that may provide additional information or quality assurance services.

Please add any other information or comments that you feel would add value to the above survey.

Please return to: Glynn Gomes Tel. (905) 338-2927 Fax: (905) 338-9579 Email: gomesg@globalserve.net

Questionnaire 2: National and International Interlaboratory Quality Assurance (ILS) Programs Pertinent to the Northern Contaminants Program

PART A: IDENTIFYING INFORMATION

1. Name of Organization Conducting ILS Program Indian & Northern Health Laboratory		
2. Name of ILS Program: Hair Mercury Quality Control Program		
3. Name and title of person completing this survey: Louis Bigras, Laboratory Technicien, Program Coordinator		
4. Contact name and title of contact person for requesting participation in the study or program: Louis Bigras, Laboratory Technicien, Program Coordinator		
5. Address: Hair Mercury Quality Control Program Indian & Northern Health Laboratory Medical Services Branch Health Canada, Room #172, Bldg. #22 Tunney's Pasture, P.L. 2201A1 Ottawa, Ontario Canada, K1A 0L2		
Phone:(613) 952-6028	**Fax:**(613) 946-2340	**Email:** Louis_Bigras@hc-sc.gc.ca

PART B: MATRICES AND PARAMETERS INVESTIGATED

Please tell us what components your quality assurance program involves. What parameters are analyzed and in which matrices (e.g. toxaphene in air, mercury in blood, etc.). What is the target concentration to be analyzed? How many samples are tested for each study? Please give an indication of the schedule of the ILS program (e.g. how many times is the program conducted each year? When do participants receive the results?). Finally, please give an indication of the cost of participation in the study.

6. Specific Parameters of Interest: toxaphene, chlordane, HCHs, congener PCBs, PCNs, radionuclides, methyl mercury, mercury, selenium, arsenic, cadmium, others (Please attach an additional page if required.)					
Parameter (e.g. trace metals, toxaphene, mercury)	**Matrices Investigated** (e.g. water, air, sediment, biota, human samples, etc.)	**Target Concentration Levels**	**# Samples/Study**	**Schedule of ILS Program (# times per year; when is the final report made?)**	**Cost for Participation in the Program**
Total Mercury	**Hair**	**0.5 to 50 PPM**	**3**	**2 times per year; Report give with next round samples.**	**No cost**
Inorganic Mercury	**Hair**	**0.5 to 50 PPM**	**3**	**2 times per year; Report give with next round samples.**	**No cost**

7. Additional Comments (e.g. how large is the program; how many labs are involved; from what geographical locations?)

Health Canada's Hair Mercury Quality Control Program started in 1991. Health Canada has been involved in the analysis of mercury in hair for the native people across Canada since 1974. No ongoing quality control for mercury in hair was available. In 1989 and 1990 we prepared and sent ground hair samples to 4 laboratories for analysis, (Health Canada in Ottawa), (Centre de Toxicologie du Quebec, CHUL, in St-Foie, Québec), (Laboratoire de santé publique du Québec,in Sainte-Anne-de-Bellevue, Québec), and (Environmental Health Sciences Centre in Rochester, New-York). We were very pleased with the results of this check sample program, and this **Interlaboratory Comparison Program** is the result. The first year (1991) we had 12 participants from North & South America, Asia, and Europe, 15 in (1992), 18 in (1993), 22 in (1994 and 1995), 23 in (1996), and 24 in (1997 and 1998). There is no cost to participants for the program. There are two round per year, three samples each round. Each sample contains about 60 mg of ground hair. Samples can be analyzed for total and inorganic mercury, or for total mercury only.

The statistical report for each round is sent with the next round of samples. The Hair Mercury - Comparison Reports uses laboratory data which has been rounded-off to the nearest first decimal, where necessary. Corrected means and standard deviations were calculated as a result of rejecting values greater than 2 standard deviations from the mean, and repeating the process until all values were less than 2 standard deviations from the mean.

8. In order to help us complete a most comprehensive listing of available ILS programs, please suggest other contacts or organizations that may provide additional information or quality assurance services.

Mercury Quality Assurance Program
Canadian Food Inspection Agency
Fish Inspection
501 University Crescent
Winnipeg, Manitoba
Canada. R3T 2N6
Contact : Erin Burns-Flett Tel : (204) 983-5077 Fax: (204) 984-2107

Programme de Comparaison Interlaboratoire
Le Centre de Toxicologie du Québec
2705, Boul. Laurier
Sainte-Foy, Qc
Canada, G1V 4G2
Contact : Dr Jean-Philippe Weber Tel: (418) 654-2100 Fax: (418) 654-2454

Please add any other information or comments that you feel would add value to the above survey.

Please return to: Glynn Gomes Tel. (905) 338-2927 Fax: (905) 338-9579 Email: gomesg@globalserve.net

Questionnaire 2: National and International Interlaboratory Quality Assurance (ILS) Programs Pertinent to the Northern Contaminants Program

PART A: IDENTIFYING INFORMATION

1. Name of Organization Conducting ILS Program Maxxam Analytical Inc., 101 Resources Rd., Toronto, ON M9P 3T1		
2. Name of ILS Program: Ontario Ministry of Labour / Association of the Chemical Profession of Ontario – Analytical Quality Assurance Program		
3. Name and title of person completing this survey: Roy Smith, Manager Occupational Health Sciences		
4. Contact name and title of contact person for requesting participation in the study or program: Dr. Ern Sullivan – Ontario Ministry of Labour		
5. Address: Ontario Ministry of Labour Professional and Specialized Services 4t Floor, 130 Dufferin Avenue N6A 5R2 London, On		
Phone: 519-646-3287	**Fax:** 519-672-0268	**Email:**

PART B: MATRICES AND PARAMETERS INVESTIGATED

Please tell us what components your quality assurance program involves. What parameters are analyzed and in which matrices (e.g. toxaphene in air, mercury in blood, etc.). What is the target concentration to be analyzed? How many samples are tested for each study? Please give an indication of the schedule of the ILS program (e.g. how many times is the program conducted each year? When do participants receive the results?). Finally, please give an indication of the cost of participation in the study.

6. Specific Parameters of Interest: toxaphene, chlordane, HCHs, congener PCBs, PCNs, radionuclides, methyl mercury, mercury, selenium, arsenic, cadmium, others (Please attach an additional page if required.)					
Parameter (e.g. trace metals, toxaphene, mercury)	**Matrices Investigated** (e.g. water, air, sediment, biota, human samples, etc.)	**Target Concentration Levels**	**# Samples/Study**	**Schedule of ILS Program (# times per year; when is the final report made?)**	**Cost for Participation in the Program**
Pb	Filter	0.15 mg/m^3	4 samples (3 samples plus blank)	Every 3 months	Currently free for laboratories in Ontario but this will change effective January 11999; cost yet to be determined; CAEAL to assume the program.
Cd	Filter	0.05 mg/m^3			
Zn	Filter	5 mg/m^3			
Cr	Filter	0.5 mg/m^3			
Hexavalent Cr	Filter	0.05 mg/m^3			
Total As	Filter	0.01 mg/m^3			
Isocyanate	Impinger	0.005 ppm			
Mercury	Impinger	0.05 mg/m^3			
Benzene	Charcoal	1 ppm			
Toluene	Charcoal	100 ppm			
Lead	Blood	Discontinued			
Formaldehyde	Tube	1 ppm			
Common ions (sulphate/sulphuric acid)	Tube	1 mg/m^3			
chloroform	Tube	10 ppm			
Dichloroethane	Tube	200 ppm			
Trichloroethylene	Tube	50 ppm			
Carbon tetrachloride	Tube	5 ppm			

7. Additional Comments (e.g. how large is the program; how many labs are involved; from what geographical locations?)

The program will deal with the air only. CAEAL is assuming the program effective January 1, 1999. Cost is yet to be determined. This year, the program was run by Maxxam (i.e. Maxxam sent out the samples) but results go back to Ministry of Labour.

8. In order to help us complete a most comprehensive listing of available ILS programs, please suggest other contacts or organizations that may provide additional information or quality assurance services.

Pat ??? , Coordinator - American Industrial Hygiene Association Tel. 703-849-8888

WASP Britain- Workplace Analytical Sampling Program, Health Safety Executive, London
-similar to this program

Rick Wilson – CAEAL Tel. 613-233-5300

Please add any other information or comments that you feel would add value to the above survey.

Please return to: Glynn Gomes Tel. (905) 338-2927 Fax: (905) 338-9579 Email: gomesg@globalserve.net

Questionnaire 2: National and International Interlaboratory Quality Assurance (ILS) Programs Pertiment to the Northern Contaminants Program

PART A: IDENTIFYING INFORMATION

1. Name of Organization Conducting ILS Program National Institute of Standards and Technology (NIST)		
2. Name of ILS Program: NIST Intercomparison Exercise Program for Organic Contaminants in the Marine Environment		
3. Name and title of person completing this survey: Michele M. Schantz, Research Chemist		
4. Contact name and title of contact person for requesting participation in the study or program: Michele M. Schantz, Research Chemist		
5. Address: NIST Bldg 222, Rm B208 Gaithersburg, MD 20899 USA		
Phone: 301-975-3106	**Fax:** 301-977-0685	**Email:** michele.schantz @nist.gov

PART B: MATRICES AND PARAMETERS INVESTIGATED

Please tell us what components your quality assurance program involves. What parameters are analyzed and in which matrices (e.g. toxaphene in air, mercury in blood, etc.). What is the target concentration to be analyzed? How many samples are tested for each study? Please give an indication of the schedule of the ILS program (e.g. how many times is the program conducted each year? When do participants receive the results?). Finally, please give an indication of the cost of participation in the study.

6. Specific Parameters of Interest: toxaphene, chlordane, HCHs, congener PCBs, PCNs, radionuclides, methyl mercury, mercury, selenium, arsenic, cadmium, others (Please attach an additional page if required.)					
Parameter (e.g. trace metals, toxaphene, mercury)	**Matrices Investigated (e.g. water, air, sediment, biota, human samples, etc.)**	**Target Concentration Levels**	**# Samples/Study**	**Schedule of ILS Program (# times per year; when is the final report made?)**	**Cost for Participation in the Program**
PAHs	Marine sediment	40-10,000 ng/g dry	1	1/yr report Dec/Jan	See attached sheet
PAHs	Mussels	1-300 ng/g dry	1	1/yr report Dec/Jan	See attached sheet
PCB Congeners	Fish homogenate	1-150 ng/g wet	1	1/yr report Dec/Jan	See attached sheet
PCB Congeners	Marine Sediment	1-90 ng/g dry	1	1/yr report Dec/Jan	See attached sheet
PCB Congeners	Mussels	1-150 ng/g dry	1	1/yr report Dec/Jan	See attached sheet
Chlorinated Pesticides	Fish homogenate	1-150 ng/g wet	1	1/yr report Dec/Jan	See attached sheet
Chlorinated Pesticides	Marine Sediment	1-150 ng/g dry	1	1/yr report Dec/Jan	See attached sheet
Chlorinated Pesticides	Mussels	1-100 ng/g dry	1	1/yr report Dec/Jan	See attached sheet
Please see attached sheets for the details !					

7. Additional Comments (e.g. how large is the program; how many labs are involved; from what geographical locations?)

# of participants averages between 30 and 50 per year with most of the participants from US labs. IAEA, NRC, and CENAM have also participated along with German and Swedish university laboratories.

8. In order to help us complete a most comprehensive listing of available ILS programs, please suggest other contacts or organizations that may provide additional information or quality assurance services.

Please add any other information or comments that you feel would add value to the above survey.

Please return to: Glynn Gomes Tel. (905) 338-2927 Fax: (905) 338-9579 Email: gomesg@globalserve.net

(Letterhead)

April, 1998

Dear Researcher/QA Officer:

Re: 1998 NIST Intercomparison Exercise Program for Organic Contaminants in the Marine Environment

Since 1987, the National Institute of Standards and Technology (NIST) has coordinated annual intercomparison exercises for laboratories determining selected organic contaminants in marine sediment and tissue samples. These exercises are part of a marine environmental analytical measurements quality assurance (QA) program in support of the National Atmospheric and Oceanic Administration (NOAA) National Status and Trends program.

In response to numerous requests, NIST has opened the intercomparison exercise portion of this QA program to any laboratory performing measurements of the organic contaminants determined in these exercises but whose participation is not funded by either NOAA or EPA. For 1998 the cost for participation in the "NIST Intercomparison Exercise Program for Organic Contaminants in the Marine Environment" will be $2500 or $2800 for a laboratory within or outside the U.S., respectively.

Table 1 lists the analytes currently being reported and evaluated in these exercises. Typical concentration ranges of these analytes in the exercise materials are shown in Table 2. Descriptions of the 1998 exercise materials are listed in Table 3. Materials from previous exercises, described in Table 3, are also available for $1000 each ($1150 outside U.S.) as listed on the attached form.

Each year, participating laboratories will be sent material for three analyses of each of two marine samples. Results submitted to NIST by October 1 will be included in a NIST report in which data are summarized and evaluated. This report will be sent to all participants and/or designated QA officers. Individual laboratory results will be identified by an assigned laboratory number which will be made known only to the individual laboratory and/or laboratory-designated QA officer. Participants will be invited to attend the annual QA workshop in which the results of these exercises are discussed. This workshop will be held sometime in January 1999 at a location yet to be decided. Laboratories will be accepted into the program each year until the available materials are depleted.

If you would like to participate in the "NIST Intercomparison Exercise Program for Organic Contaminants in the Marine Environment", please complete the enclosed form and mail or FAX it to Michele Schantz at the listed address. If you need additional technical information, please contact Michele Schantz (301-975-3106; FAX 301-977-0685; E-mail: michele.schantz@nist.gov; NIST, Chemistry B208, Gaithersburg, MD USA 20899).

Sincerely,

Michele M. Schantz
Research Chemist
Analytical Chemistry Division
Chemical Science and Technology Laboratory

Stephen A. Wise
Supervisory Research Chemist
Analytical Chemistry Division
Chemical Science and Technology Laboratory

Attachment

bc: Sharon Cook

Table 1. Analytes[a] of Interest in NIST Intercomparison Exercise Program for Organic Contaminants in the Marine Environment

Chlorinated Pesticides

hexachlorobenzene	2,4'-DDE
alpha-HCH (alpha-BHC)	4,4'-DDE
gamma-HCH (gamma-BHC, Lindane)	2,4'-DDD
heptachlor	4,4'-DDD
heptachlor epoxide	2,4'-DDT
cis-chlordane (alpha-chlordane)	4,4'-DDT
trans-chlordane (gamma-chlordane)	aldrin
oxychlordane	dieldrin
cis-nonachlor	endrin
trans-nonachlor	endosulfan I
mirex	endosulfan II

Polychlorinated Biphenyl Congeners

PCB No.	*Compound Name*
8	2,4'-dichlorobiphenyl
18	2,2',5-trichlorobiphenyl
28	2,4,4'-trichlorobiphenyl
44	2,2',3,5'-tetrachlorobiphenyl
52	2,2',5,5'-tetrachlorobiphenyl
66	2,3',4,4'-tetrachlorobiphenyl
101	2,2',4,5,5'-pentachlorobiphenyl
105	2,3,3',4,4'-pentachlorobiphenyl
118	2,3',4,4',5-pentachlorobiphenyl
128	2,2',3,3',4,4'-hexachlorobiphenyl
138	2,2',3,4,4',5'-hexachlorobiphenyl
153	2,2',4,4',5,5'-hexachlorobiphenyl
170	2,2',3,3',4,4',5-heptachlorobiphenyl
180	2,2',3,4,4',5,5'-heptachlorobiphenyl
187	2,2',3,4',5,5',6-heptachlorobiphenyl
195	2,2',3,3',4,4',5,6-octachlorobiphenyl
206	2,2',3,3',4,4',5,5',6-nonachlorobiphenyl
209	decachlorobiphenyl

Table 1. (continued)

Polycyclic aromatic hydrocarbons (PAH)

naphthalene
2-methylnaphthalene
1-methylnaphthalene
biphenyl
2,6-dimethylnaphthalene
acenaphthylene
acenaphthene
1,6,7-trimethylnaphthalene
fluorene
phenanthrene
anthracene
1-methylphenanthrene
fluoranthene
pyrene
benz[*a*]anthracene
chrysene
benzo[fluoranthenes [*b*+*j*+*k*]
benzo[*e*]pyrene
benzo[*a*]pyrene
perylene
indeno[1,2,3-*cd*]pyrene
dibenz[*a,h*]anthracene
benzo[*ghi*]perylene

[a] Please note that the following are typically reported by participants as the sums of the indicated components:

PAH
chrysene + triphenylene
benzo[*b*]- + benzo[*j*]- + benzo[*k*]fluoranthene
dibenz[*a,h*]anthracene + dibenz[*a,c*]anthracene

PCB congeners
PCB 101 + PCB 90
PCB 138 + PCB 163 + PCB 164
PCB 187 + PCB 182 + PCB 159
PCB 170 + PCB 190

Table 2. Typical Concentration Ranges of Determined Compounds

	Great Lakes Fish Homogenate ng/g wet wt.	Marine Sediment ng/g dry wt.	Mussels ng/g dry wt.
PAHs	not determined	40 to 10 000	1 to 300
PCB Congeners	1 to 150	1 to 90	1 to 150
Chlorinated Pesticides	1 to 150	1 to 150	1 to 100

Table 3. Descriptions of Currently Available Interlaboratory Comparison Materials

1998 Exercise Materials:

Marine Sediment VIII QA98SED8

3 x 21.0 g (wet basis) of a wet marine sediment
(Each sample was prepared by adding a known mass of water to a known mass of marine sediment that was collected from a site on Vancouver Island and has been freeze-dried, ground, sieved, and radiation-sterilized. This material is stored at -80 °C until shipped to participants on dry ice.)

Mussel Tissue IX QA98TIS9

3 x ~17 g (wet weight) of a frozen mussel tissue homogenate
(The tissue, collected in Boston Harbor, is a cryogenically homogenized "fresh" material still containing its endogenous water. This material is stored at -80 °C until shipped to participants on dry ice.)

Materials Available From Previous Exercises:

Marine Sediment VII QA97SED7

3 x 21.0 g (wet basis) of a wet marine sediment
(Each sample was prepared by adding a known mass of water to a known mass of marine sediment collected from several East coast sites that had been combined, freeze-dried, sieved, blended, radiation-sterilized and homogenized. This material is stored at -80 °C until shipped to participants on dry ice.)

Mussel Tissue VIII QA97TIS8

2 x ~10 g (dry basis) of a freeze-dried mussel tissue
(These materials are relabeled bottles of candidate NIST RM 8046, GESREM III Mussel, a freeze-dried tissue homogenate from mussels collected in Guanabara Bay, South America. Typically, the amount of material used for each tissue intercomparison replicate analysis should correspond to the amount of marine bivalve tissue (wet basis) you would typically analyze as prescribed in your protocols; however, analyses of this material indicate that the concentrations of some of these analytes are lower than in SRM 1974a Mussel Tissue. We have included additional material so that you can increase your sample size if this would be appropriate for your program. A 3-g (dry basis) sample of Mussel Tissue VIII would correspond to approximately 20 g of the original wet mussel tissue homogenate prior to freeze-drying.)

Marine Sediment VI QA96SED6

3 x 21.0 g (wet basis) of a wet marine sediment
(Each sample was prepared by adding a known mass of water to a known mass of marine sediment collected from several East coast sites that had been combined, freeze-dried, sieved, blended, radiation-sterilized and homogenized. This material is stored at -80 °C until shipped to participants on dry ice.)

Mussel Tissue VII QA96TIS7

3 x ~20 g (wet basis) of a frozen mussel tissue homogenate
(The tissue is a cryogenically homogenized "fresh" material still containing its endogenous water. This material is stored at -80 °C until shipped to participants on dry ice.)

Marine Sediment V QA95SED5

3 x 21.0 g (wet basis) of a wet marine sediment; Marine Sediment V has significantly higher PAH and PCB concentrations relative to Marine Sediment IV and Marine Sediment III (SRM 1941a).
(Each sample was prepared by adding a known mass of water to a known mass of marine sediment collected from several New York/New Jersey sites that had been combined, freeze-dried, sieved, blended, radiation-sterilized and homogenized. This material is stored at -80 °C until shipped to participants on dry ice.)

Fish Homogenate III QA95FSH3 - for PCB/pesticide measurements only

3 x 9 g (wet basis) of a stabilized slurry of ground whole carp from Lake Huron
(The fish homogenate, prepared by the National Research Council of Canada (NRC), is ground whole carp to which a small amount of water was added to raise the moisture content to 85 percent and 0.02 percent of ethoxyquin was added as an antioxidant. The material in the sealed ampoules was heated for a very short time at 121 °C to destroy the enzyme that promotes rancidity.)

Marine Sediment IV QA94SED4

3 x 21.0 g (wet weight) of a wet marine sediment
(Each sample was prepared by adding a known mass of water to a known mass of a marine sediment that had been freeze-dried, sieved, blended, radiation-sterilized and homogenized. This material is stored at -80 °C until shipped to participants on dry ice.)

Mussel Tissue VI QA94TIS6

1 x 6 g (dry basis) of a freeze-dried mussel tissue
(This tissue, a subset of GESREM II Mussel Material, was collected at Raritan Bay, shucked and freeze-dried. At NIST, this material was milled, sieved, homogenized, radiation-sterilized and bottled.)

Fish Homogenate I QA93FSH1 is now available from the National Research Council of Canada as CARP-1 Reference Material.

Mussel Tissue V QA93TIS5 is now available from NIST as Standard Reference Material 1974a, Organics in Mussel Tissue.

Marine Sediment III QA92SED3 is now available as a dry marine sediment from the NIST Standard Reference Materials Program as SRM 1941a, Organics in Marine Sediment.

These materials have not been enriched or spiked.

NIST Intercomparison Exercise Program for Organic Contaminants in the Marine Environment

If you would like to participate in the described program, please complete and return this form.

Participation to Include:

1998 Exercises

		Cost:		
QA98SED8	Marine Sediment VIII	☐	$2500 (within U.S.)	☐ $2800 (outside U.S.)
QA98TIS9	Mussel Tissue IX			

Previous Exercises:

QA97SED7	Marine Sediment VII	Cost: ☐	$1000 (within U.S.)	☐ $1150 (outside U.S.)
QA97TIS8	Mussel Tissue VIII	Cost: ☐	$1000 (within U.S.)	☐ $1150 (outside U.S.)
QA96SED6	Marine Sediment VI	Cost: ☐	$1000 (within U.S.)	☐ $1150 (outside U.S.)
QA96TIS7	Mussel Tissue VII	Cost: ☐	$1000 (within U.S.)	☐ $1150 (outside U.S.)
QA95SED5	Marine Sediment V	Cost: ☐	$1000 (within U.S.)	☐ $1150 (outside U.S.)
QA95FSH3	Fish Homogenate II	Cost: ☐	$1000 (within U.S.)	☐ $1150 (outside U.S.)
QA94SEDIV	Marine Sediment IV	Cost: ☐	$1000 (within U.S.)	☐ $1150 (outside U.S.)
QA94TIS6	Mussel Tissue VI	Cost: ☐	$1000 (within U.S.)	☐ $1150 (outside U.S.)

	Name	Voice Phone	FAX
Samples to be sent to:	_____	_____	_____
Results to be sent to:	_____	_____	_____

Mailing Address:

_____

_____

_____

Shipping Address (include street)

_____

_____

_____

E-mail Address: _____

Any "receiving" restrictions (e.g., no shipments accepted on Fridays)?

_____

Currently in your laboratory's analyses:

Classes of Analytes		Sample Matrices Type		Typical Amount (wet/dry)
PAHs	☐	Marine Sediment	☐	_____
Chlorinated Pesticides	☐	Bivalve Tissue	☐	_____
PCBs		River Sediment	☐	_____
As Single Congeners	☐	Fish Tissue	☐	_____
Total	☐	Other _____	☐	_____
As Aroclors	☐	_____	☐	_____
Other _____	☐	_____	☐	_____

Invoice to be sent to:

Address (if different from above): _____ Phone: _____

_____

_____

_____

RETURN THIS COMPLETED FORM TO:

Michele Schantz
NIST, 222/B208
Gaithersburg, MD 20899

FAX 301/977-0685
Voice 301/975-3106

DATE: _____

Questionnaire 2: National and International Interlaboratory Quality Assurance (ILS) Programs Pertinent to the Northern Contaminants Program

PART A: IDENTIFYING INFORMATION

1. Name of Organization Conducting ILS Program National Research Council of Canada for the Coastal Monitoring and Bioeffects Assessment Division, Office of Ocean Resources Conservation and Assessment, National Oceanic and Atmospheric Administration (NOAA).		
2. Name of ILS Program: NOAA Intercomparison for Trace Metals in Marine Sediments and Biological Tissues		
3. Name and title of person completing this survey: Scott Willie Research Officer		
4. Contact name and title of contact person for requesting participation in the study or program: Scott Willie		
5. Address: Institute for National Measurement Standards, National Research Council of Canada, Ottawa, Ontario, K1A 0R9		
Phone: 613 993 4969	**Fax:** 613 993 2451	**Email:** scott.willie@nrc.ca

PART B: MATRICES AND PARAMETERS INVESTIGATED

Please tell us what components your quality assurance program involves. What parameters are analyzed and in which matrices (e.g. toxaphene in air, mercury in blood, etc.). What is the target concentration to be analyzed? How many samples are tested for each study? Please give an indication of the schedule of the ILS program (e.g. how many times is the program conducted each year? When do participants receive the results?). Finally, please give an indication of the cost of participation in the study.

6. Specific Parameters of Interest: toxaphene, chlordane, HCHs, congener PCBs, PCNs, radionuclides, methyl mercury, mercury, selenium, arsenic, cadmium, others (Please attach an additional page if required.)					
Parameter (e.g. trace metals, toxaphene, mercury)	**Matrices Investigated** (e.g. water, air, sediment, biota, human samples, etc.)	**Target Concentration Levels**	**# Samples/Study**	**Schedule of ILS Program (# times per year; when is the final report made?)**	**Cost for Participation in the Program**
Trace metals Be, Al, Si, Cr, Mn, Fe, Ni, Cu, Zn, As, Se, Ag, Cd, Sn, Sb, Hg, Tl, Pb	-sediment	-unknown samples vary in concentration. -an attempt is made to alternate between contaminated and pristine samples.	- two samples are analysed -one sample of unknown concentration -one certified reference material (CRM)	-annual -samples distributed in April -results due in Sept. -final report issued in Dec.	?? depends upon the number of laboratories -see comment below

Trace Metals **Al, Cr, Fe, Ni, Cu, Zn,** **As, Sc, Ag, Cd, Sn,** **Sb, Hg, Pb**	**-biological tissue** **-usually a mussel or** **oyster tissue**	**-concentrations of the** **unknown sample vary** **depending on** **sampling location**	**-as above**	**-as above**	**-as above**

7. Additional Comments (e.g. how large is the program; how many labs are involved; from what geographical locations?)

The original purpose of this exercise was to assess the capabilities of a number of NOAA and other laboratories involved in the NOAA - National Status and Trends program to analyse marine sediments and biological tissues for trace metals. Since 1990 external participation has expanded to 40 to 50 laboratories including USEPA, state, Australian, Canadian, Mexican, Argentinean and Spanish laboratories. NOAA limits enrolment to non-profit government and university laboratories. This year, 1998, is the twelfth intercomparison exercise organised by NRC for NOAA. NOAA limits the number of participants to 50. NOAA pays NRC a base price for the intercomparison including 20 participants with an extra fee for each additional laboratory.

With the permission of NOAA, and at the invitation of NRC, several private Canadian laboratories have participated over the last few years. These labs are charged $300 per year by NRC. This fee is quite reasonable as two or three additional labs can be worked into the program with minimal effort. However, if more laboratories joined or if additional elements or parameters were requested other than the NOAA requirements, the cost per lab would increase.

8. In order to help us complete a most comprehensive listing of available ILS programs, please suggest other contacts or organizations that may provide additional information or quality assurance services.

NIST/ NOAA Intercomparison for Organics in Marine Samples - Michele Schantz (michele.schantz@nist.gov)

Please add any other information or comments that you feel would add value to the above survey.

Please return to: Glynn Gomes Tel. (905) 338-2927 Fax: (905) 338-9579 Email: gomesg@globalserve.net

Questionnaire 2: National and International Interlaboratory Quality Assurance (ILS) Programs Pertinent to the Northern Contaminants Program

PART A: IDENTIFYING INFORMATION

1. Name of Organization Conducting ILS Program National Research Council Canada's Institute for Marine Biosciences		
2. Name of ILS Program: **Certified Reference Materials Program**		
3. Name and title of person completing this survey: Denise LeBlanc, Research Officer		
4. Contact name and title of contact person for requesting participation in the study or program: Denise LeBlanc, Research Officer		
5. Address: 1411 Oxford Street Halifax, Nova Scotia B3H 3Z1		
Phone: 902-426-8280	**Fax:** 902-426-9413	**Email:** Denise.leblanc@nrc.ca

PART B: MATRICES AND PARAMETERS INVESTIGATED

Please tell us what components your quality assurance program involves. What parameters are analyzed and in which matrices (e.g. toxaphene in air, mercury in blood, etc.). What is the target concentration to be analyzed? How many samples are tested for each study? Please give an indication of the schedule of the ILS program (e.g. how many times is the program conducted each year? When do participants receive the results?). Finally, please give an indication of the cost of participation in the study.

6. Specific Parameters of Interest: toxaphene, chlordane, HCHs, congener PCBs, PCNs, radionuclides, methyl mercury, mercury, selenium, arsenic, cadmium, others (Please attach an additional page if required.)					
Parameter (e.g. trace metals, toxaphene, mercury)	**Matrices Investigated (e.g. water, air, sediment, biota, human samples, etc.)**	**Target Concentration Levels**	**# Samples/Study**	**Schedule of ILS Program (# times per year; when is the final report made?)**	**Cost for Participation in the Program**

7. Additional Comments (e.g. how large is the program; how many labs are involved; from what geographical locations?)

The NRC's Certified Reference Materials Program (CRMP) does not currently run any ILS programs. We do provide reference materials for PCBs, PAHs, and trace elements when required. Several organizations have purchased our certified reference materials as "test samples" for their Intercomparison studies.

8. In order to help us complete a most comprehensive listing of available ILS programs, please suggest other contacts or organizations that may provide additional information or quality assurance services.

The Canadian Association of Environmental Analytical Laboratories, Dr. Rick Wilson, 613-233-5300
NIST/NOAA Intercomparison Exercise, Dr. Michele Schantz, 301-975-3106

Please add any other information or comments that you feel would add value to the above survey.

Please return to: Glynn Gomes Tel. (905) 338-2927 Fax: (905) 338-9579 Email: gomesg@globalserve.net

Questionnaire 2: National and International Interlaboratory Quality Assurance (ILS) Programs Pertinent to the Northern Contaminants Program

PART A: IDENTIFYING INFORMATION

1. Name of Organization Conducting ILS Program National Water Research Institute, Environment Canada		
2. Name of ILS Program: **NWRI Ecosystem Quality Assurance Program**		
3. Name and title of person completing this survey: Harry Alkema, QA Specialist (for Interlab studies & CRMs)		
4. Contact name and title of contact person for requesting participation in the study or program: position vacant		
5. Address: 867 Lakeshore Rd Burlington ON L7R 4A6 Canada		
Phone: 905-336-4929	**Fax:** 905-336-8914	**Email:** Harry.Alkema@CCIW.ca

PART B: MATRICES AND PARAMETERS INVESTIGATED

Please tell us what components your quality assurance program involves. What parameters are analyzed and in which matrices (e.g. toxaphene in air, mercury in blood, etc.). What is the target concentration to be analyzed? How many samples are tested for each study? Please give an indication of the schedule of the ILS program (e.g. how many times is the program conducted each year? When do participants receive the results?). Finally, please give an indication of the cost of participation in the study.

6. Specific Parameters of Interest: toxaphene, chlordane, HCHs, congener PCBs, PCNs, radionuclides, methyl mercury, mercury, selenium, arsenic, cadmium, others (Please attach an additional page if required.)					
Parameter (e.g. trace metals, toxaphene, mercury)	**Matrices Investigated** (e.g. water, air, sediment, biota, human samples, etc.)	**Target Concentration Levels**	**# Samples/Study**	**Schedule of ILS Program (# times per year; when is the final report made?)**	**Cost for Participation in the Program**
trace elements	**water**	**0.1 - 500. µg/l**	**10**	**2, June & Dec**	**$550 (discounted when also doing major ions)**
Mercury (total)	**water**	**0.005 - 0.4 µg/l**	**10**	**1, December**	**$250**

7. Additional Comments (e.g. how large is the program; how many labs are involved; from what geographical locations?)

There are usually about 60 labs which participate. They may select any set of parameters in 5 different studies of 10 samples. These studies are; major ions and nutrients in surface waters, major ions and nutrients in precipitation and soft waters, trace elements in water and total phosphorus in water. These studies are twice yearly and the Total Mercury in water is done annually.
Clients are mostly from public and private labs in Canada. There are quite a few labs from the US which participate in the rainwater and soft water studies. We have 4 labs from overseas that are currently participating.

8. In order to help us complete a most comprehensive listing of available ILS programs, please suggest other contacts or organizations that may provide additional information or quality assurance services.

None

Please add any other information or comments that you feel would add value to the above survey.

Please return to: Glynn Gomes Tel. (905) 338-2927 Fax: (905) 338-9579 Email: gomesg@globalserve.net

Questionnaire 2: National and International Interlaboratory Quality Assurance (ILS) Programs Pertinent to the Northern Contaminants Program

PART A: IDENTIFYING INFORMATION

1. Name of Organization Conducting ILS Program QUASIMEME (Quality Assurance Of Information For Marine Environmental Monitoring in Europe)		
2. Name of ILS Program: QUASIMEME II International Laboratory Performance Studies (known and referred to as the QUASIMEME *LP Studies*)		
3. Name and title of person completing this survey: from brochure: "The QUASIMEME Laboratory Performace Studies. Year 3. June 1998 to May 1999. Issue 4 February 1998."		
4. Contact name and title of contact person for requesting participation in the study or program: QUASIMEME Project Office, complete application sheet (blue sheet) in the brochure		
5. Address: QUASIMEME Laboratory Performance Studies FRS Marine Laboratory PO Box 101 Victoria Road ABERDEEN AB9 8DB United Kingdom		
Phone: +44 1224 876544 +44 1224 295352 (Project Office Direct)	**Fax:** + 44 1224 295511	**Email:** quasimeme@marlab.ac.uk

PART B: MATRICES AND PARAMETERS INVESTIGATED

Please tell us what components your quality assurance program involves. What parameters are analyzed and in which matrices (e.g. toxaphene in air, mercury in blood, etc.). What is the target concentration to be analyzed? How many samples are tested for each study? Please give an indication of the schedule of the ILS program (e.g. how many times is the program conducted each year? When do participants receive the results?). Finally, please give an indication of the cost of participation in the study.

6. Specific Parameters of Interest: toxaphene, chlordane, HCHs, congener PCBs, PCNs, radionuclides, methyl mercury, mercury, selenium, arsenic, cadmium, others (Please attach an additional page if required.)					
Parameter (e.g. trace metals, toxaphene, mercury)	**Matrices Investigated** (e.g. water, air, sediment, biota, human samples, etc.)	**Target Concentration Levels**	**# Samples/Study**	**Schedule of ILS Program (# times per year; when is the final report made?)**	**Cost for Participation in the Program**
-see attached brochure, pp. 5 to 10	-see attached brochure, pp. 5 to 10	Ranges will reflect those found in estuarine, coastal and open water areas	-see attached brochure, pp. 5 to 10	-see attached brochure, pp. 5 to 10	See page 11, 12 of broachure; now no annual subscription fee for QUASIMEME; fee for each group of studies; discount of 10% on the total amount for all laboratories that select 10 or more groups

7. Additional Comments (e.g. how large is the program; how many labs are involved; from what geographical locations?)

See attached brochure. The future program may include new study materials with additional determinants if there is sufficient demand. Performance of the participant is not disclosed to any third party.

8. In order to help us complete a most comprehensive listing of available ILS programs, please suggest other contacts or organizations that may provide additional information or quality assurance services.

Please add any other information or comments that you feel would add value to the above survey.

Please return to: Glynn Gomes Tel. (905) 338-2927 Fax: (905) 338-9579 Email: gomesg@globalserve.net

The QUASIMEME Laboratory Performance Studies

The Timetable and Content of the Studies June 1998 to May 1999

Participant who select the ***Fast Track*** option receive their samples **one** month before the deadline. All other participants receive their samples at the start date.

Study Period	Round	Start date	Fast Track	Deadline	Report available
1 (5 months)	14	June 1 1998	September 30 1998	October 30 1998	January 30 1999
2 (4 months)	15	October 1 1998	January 3 1999	January 30 1999	April 30 1999
3 (5 months)	16	December 1 1998	March 30 1999	April 30 1999	July 30 1999
4 (5 months)	17	April 1 1999	June 30 1999	July 30 1999	October 30 1999

Study Period	Round	Group No	No. of samples in a group	Determinand Group	Matrix	£UK/group
	AQUEOUS SAMPLES					
1&3	14 & 16	AQ-1	2+2'	Nutrients	Seawater	270
1&3	14 & 16	AQ-2	3+3	Nutrients (Low salinity 2 high 1 low concentration)	Estuarine water	290
2&4	15 & 17	AQ-3	2+2	Metals (other than Hg)	Seawater	270
2&4	15 & 17	AQ-4	2+2	Mercury	Seawater	245
2&4	15 & 17	AQ-5	2+2	Chlorinated organics	Seawater	245
2&4	15 & 17	AQ-6	2+2	Chlorinated volatiles	Seawater	245
2&4	15 & 17	AQ-7	2+2	Pentachlorophenol	Seawater	245
2&4	15 & 17	AQ-8 ✓	2+2	Triazines & Organophosphorus organics	Seawater	245
	SEDIMENTS - A full stabilised wet sediment will be included from round 16					
1&3	14 & 16	MS-1 ✓	2+2	Trace metals	Silty Sediment	
1&3	14 & 16	MS-2 ✓	2+2	Chlorinated organics	Silty Sediment	280
1&3	14 & 16	MS-3 ✓	2+2	PAHs	Silty Sediment	
	BIOTA - Stabilised wet biological tissue					
1&3	14 & 16	BT-1 ✓	2+2	Trace metals	Fish & shellfish	310
1&3	14 & 16	BT-2 ✓	2+2	Chlorinated organics	Fish & shellfish	310
1	14	BT-3	2	Non ortho CBs, PCDDs and PCDFs	Fish & Shellfish	370
3	16	BT-4 ✓	2	PAHs	Shellfish	370
	DEVELOPMENT EXERCISES					
1	14	DE-1	3	PAH Metabolites	Soln. & bile	360
1	14	DE-2	3	Toxaphene	Soln. & extracts	360
3	16	DE-3	3	Organotins	Soln. & shellfish	360
3	16	DE-5	3	Organotins	Soln. & seawater	360
2	13	DE-6	3	Chlorophyll-a	Soln. & filtered sample	270

Notes on the Content of the Studies.

Number of samples in a group. Normally there will be two materials supplied for each set of determinands at two concentrations for the two study periods. Hence "2 in study period 1" + "2 in study period 3". Where there are only 2 materials offered in a group, these will be supplied for a single study period. So for example, in Group AQ-1 for Nutrients in seawater there would be two samples in the first study period of the *LP Studies* year (June to October) and a further two samples in the third study period (December to April).

The numbers of some groups are not always continuous e.g. DE-4 Development exercise for trace metals in seawater is not repeated this year. However, once a group designation has been used it will not be reassigned to a new set of determinands or matrices in order to avoid confusion in subsequent years.

Numbers of Participants for each Study. There are sufficient participants for most groups of determinands. However, where the numbers of participants is less than 10, the samples will not be issued and the study postponed until such time as there is sufficient demand for that analysis. The following groups fall under that category.

AQ-6 Chlorinated volatiles in seawater
AQ-7 Pentachlorophenol in water

BE-3 Non-ortho CBs, PCDDs and PCDFs in biota. This group was a new development in the 1997-8 programme. Participants in the 1997-98 programme are invited to subscribe to this group **free of charge** in order to build-up the participation in this study.

Changes to the 1997- 98 Studies A number of changes have been made to the studies offered in year 2. These are as follows:

Deletions
Aldrin, endrin and isodrin have been deleted from AQ-5 seawater, MS-2 sediments and BT-3 biota because the natural levels in the marine environment are usually below the current limit of determination and most participants are not analysing for these compounds

Additions

A sample containing a low concentration of nutrients have been **added** to the AQ-2 group of low salinity samples. There will be three samples in this group. The remaining two samples will contain higher concentrations of nutrients similar to those found inshore. The salinity of these samples will be between 10 -13 psu.

A WET STABILISED SEDIMENT will be added to MS-1, MS-2 and MS-3 to extend the efficacy of the test to include the extraction- digestion of a sediment. This has been possible through the developments within the EU - QUASH project.

TOC in MS-2 to MS-3
Total lipid and extractable lipid to BT-2 and BT-4

Dry weight to BT-1

The following PAHs have been added to MS-3 and BT-4 in line with the US EPA list. Acenaphthene, acenaphthylene, anthracene, benzo[k]fluoranthene, dibenz[ah]anthracene, fluorene and naphthalene.

Development exercises. In addition to the regular studies, QUASIMEME offers a set of samples for the laboratory which may have a need to develop that particular analysis. These samples can be used to validate calibration, detection limits, recovery etc. The development exercises contain a range of samples in a single set of studies. A full protocol and study instructions will be issued with each exercise.

Organotins in Seawater (DE-5) will include a series of solutions for calibration and seawater samples for analysis. These samples are likely to be filtered seawater and spiking solutions due to the instability of the determinands.

Chlorophyll-a (DE-6) has been added, by the request of participants, as a development exercise. This will include a series of standard solutions in acetone and samples prepared on filter paper ready for extraction and measurement. This is a new prototype development and the first exercise will test the method of sample distribution as well as the measurements from the participants. Since this is an exploratory exercise there will be no formal assessment with Z scores for this first exercise. The information gathered will be used to improve the test for future rounds.

New Determinands and Matrices The number of study materials and determinands offered to all participants continues to grow in response to the requests from the participants. A table of new determinands and matrices proposed for a future year has been published in the QUASIMEME Bulletin No.5 March 1998.

Additional matrices or determinands other than those listed in this brochure may be requested for inclusion in the *LP Studies* in future years. Please contact the QUASIMEME Project Office with your proposal. If there is a sufficient number of other participants who wish to undertake these analyses then we will endeavour to include them in the *LP Studies* the following year.

Study Samples

The QUASIMEME *LP Studies* offer the following study materials which include an extensive range of determinands. Refer to the Timetable and Content of the Studies and to the schematic diagram.

Seawater Samples

Seawater will be provided as filtered samples. In most cases a specific volume of seawater will be provided along with a spiking solution and specific instruction on the preparation of the study sample. Other seawater samples will be provided for analysis "as received". Specific information will be given with each set of study materials.

AQ-1 Nutrients in filtered seawater

Nitrate + nitrite (TOxN), Nitrite, Ammonia, Orthophosphate, Silicate, Total -N and Total -P

AQ-2 Nutrients in filtered estuarine (low salinity) water

Nitrate + nitrite (TOxN), Nitrite, Ammonia, Orthophosphate, Silicate, Total -N and Total - P

AQ-3 Metals in seawater

Arsenic, Cadmium, Chromium, Copper, Lead, Nickel, Zinc

AQ-4 Metals in seawater

Total mercury

Mercury is offered as a separate determinand since it is necessary to prepare and ship this element separately. All trace metals in seawater come as complete, filtered samples in ca 0.6% nitric acid in seawater.

AQ-5 Chlorinated organics in seawater

α, β and γ HCH, HCB, HCBD, p,p' DDE, p,p' DDD, p,p' DDT, o,p' DDT, Dieldrin, Trifluralin, Total Endosulphan (I & II), 1,2,4, TCB, 1,3,5 TCB, 1,2,3 TCB

Samples will be shipped either as pre-spiked material or with a spiking solution in methanol.

AQ-6 Chlorinated volatiles in seawater

Chloroform, Carbon tetrachloride, Trichloroethane, 1,2 Dichloroethane, Trichloroethene, Tetrachloroethene

Samples will be shipped either as pre-spiked material or with a spiking solution in methanol.

AQ-7 Pentachlorophenol in seawater

PCP is offered as a separate determinand since it is usually determined by a different method and requires a separate volume of sample.

AQ-8 Triazines & Organophosphorus compounds in seawater

Simazine, Atrazine, Azinphos-methyl, Azinphos-ethyl, Fenthion, Malathion, Parathion, Parathion-methyl, Fenitrothion, Dichlorvos, Diazinon, Fenchlorophos, Coumaphos, Chlorfenvinphos.

Sediments

MS-1 Metals in sediment, including wet, stabilised material in Round 16
Aluminium, Arsenic, Cadmium, Chromium, Copper, Iron, Lithium, Lead, Manganese, Mercury, Nickel, Scandium, Zinc, TOC, inorganic carbonate

MS-2 Chlorinated organics, including wet, stabilised material in Round 16
CB 28, CB 52, CB 101, CB 105, CB 118, CB 138[2], CB 153, CB 156, CB 180, α, β and γ HCH, HCB, p,p' DDE, p,p' DDD, p,p' DDT, o,p' DDT, dieldrin, transnonachlor, TOC

MS-3 PAHs, including wet, stabilised material in Round 16
Acenaphthene, Acenaphthylene, Anthracene, Benzo[a]anthracene, Benzo[a]pyrene, Benzo[b]fluoranthene, Benzo[k]fluoranthene, Benzo[e]pyrene, Benzo[g,h,i]perylene, Chrysene, Dibenz[ah]anthracene, Fluorene, Fluoranthene, Indeno[1,2,3,cd]pyrene, Naphthalene, Phenanthrene, Pyrene, TOC.

Biota

BT-1 Metals
Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Zinc, Selenium, dry weight.

BT-2 Chlorinated organics
CB 28, CB 52, CB 101, CB 105, CB 118, CB 138, CB 153, CB 156, CB 180, α, β and γ HCH, HCB, p,p' DDE, p,p' DDD, p,p' DDT, o,p' DDT, dieldrin, transnonachlor, total lipid and extractable lipid.

BT-3 Non-ortho CBs, PCDFs & PCDDs
CB 77, CB 126, CB 169
2378-TCDF, 12378 PeCDF, 23478 PeCDF, 123478 HxCDF, 123678HxCDF, 234678 HxCDF, 123789 HxCDF, 1234678 HpCDF, OCDF
2378 TCDD, 12378 PeCDD, 123478 HxCDD, 123678 HxCDD, 123789 HxCDD, 234678 HpCDD, OCDD

BT-4 PAHs
Acenaphthene, Acenaphthylene, Anthracene, Benzo[a]anthracene, Benzo[a]pyrene, Benzo[b]fluoranthene, Benzo[k]fluoranthene, Benzo[e]pyrene, Benzo[g,h,i]perylene, Chrysene, Dibenz[ah]anthracene, Fluorene, Fluoranthene, Indeno[1,2,3,cd]pyrene, Naphthalene, Phenanthrene, Pyrene, total lipid and extractable lipid,

[2] "CB 138" is equivalent to CB 138 + CB 163 unless declared otherwise by the participant. Most participants are not separating these congeners on a routine basis at present.

Development Exercises

DE-1 PAH metabolites

A series of standard solutions and fish bile extracts spiked with PAH metabolites which can be used to test and validate method development for these adducts. The metabolites in the present studies are: 1-Hydroxy benzo[a]pyrene, 1-Hydroxy pyrene, 3-Hydroxy benzo[a]pyrene. Additional metabolites will be added to the list as the programme develops.

DE-2 Toxaphene

A series of standard solutions and cleaned-up fish tissue extracts which can be used to test the methods of separation and quantification of toxaphene congeners. The congeners on the present study list are: CHB26, CHB32, CBH50, CHB62. Additional congeners will be added to the list as the programme develops.

DE-3 Organotins in biota

A series of solutions containing Organotins in solution and shellfish to test the methods of calibration and sample preparation. The organotins on the study list are: monobutyl, dibutyl and tributyl tin and monophenyl, diphenyl and triphenyl tin.

DE-5 Organotins

A series of solutions containing Organo tins in solution and in seawater to test the methods of calibration and sample preparation. The organotins on the study list are: monobutyl, dibutyl and tributyl tin and monophenyl, diphenyl and triphenyl tin. The seawater will be provided as a filtered sample with solutions of the organotins for spiking.

DE-6 Chlorophyll-a

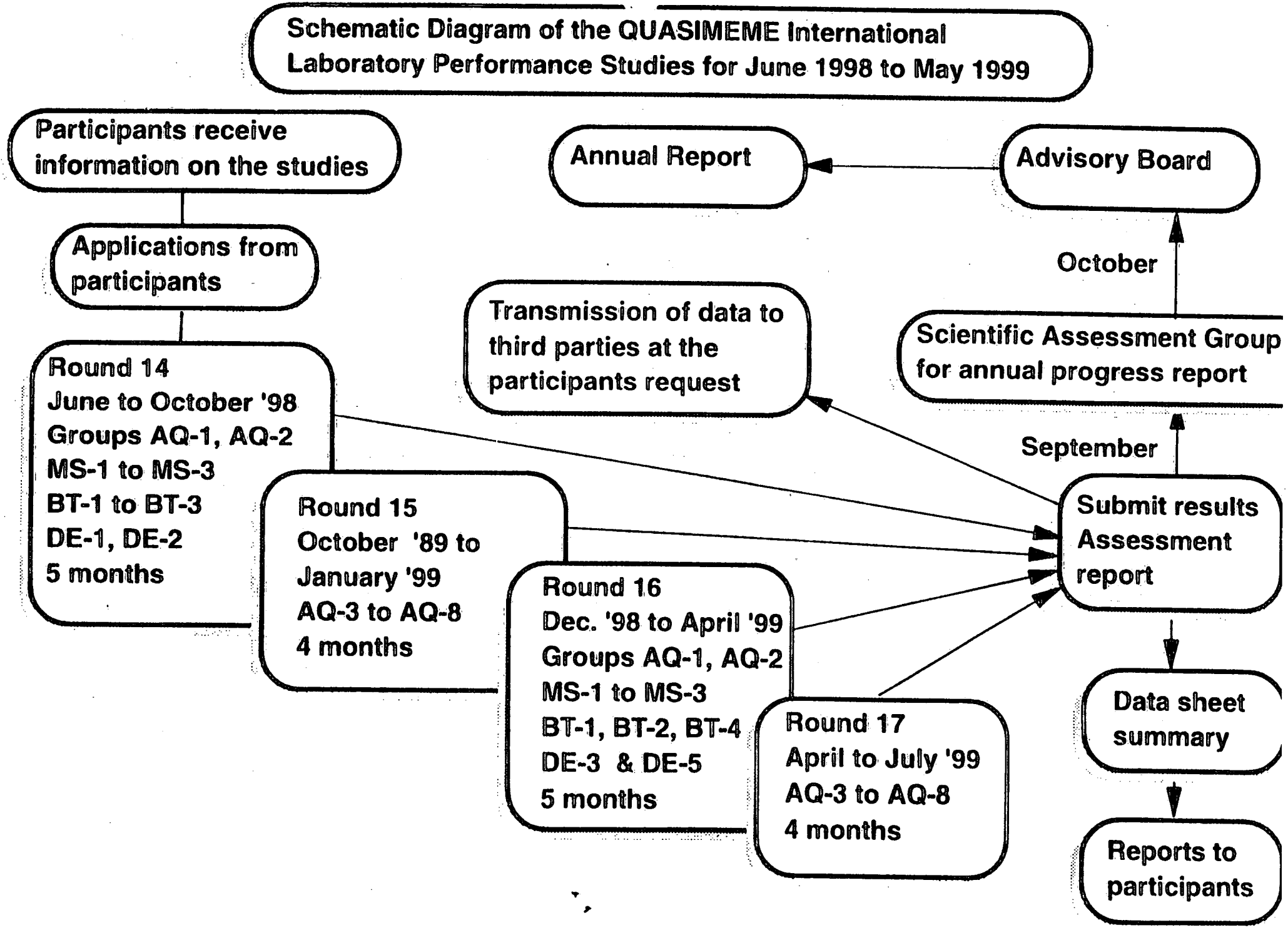
A series of standard solutions and filter papers containing a filtered seawater will be distributed cold. This first exercise is a feasibility study and a formal assessment will not be made. The information will be used as a basis for a workshop on Chlorophyll a measurements and then to add it to the regular list of parameters.

Data Transmission to Third Parties

As part of the service to participants QUASIMEME will provide all laboratories with their summary records for the year on diskette. These data may be used as a summary record for the institute and copies may be made to forward to any third party requiring them as supportive evidence of the performance of the laboratory.

Announcement of Future Studies

The QUASIMEME *LP Studies* programme will be decided for each year (June to May) in the previous November. Information on additional or the current matrices and determinand required by participants should be sent to the QUASIMEME Project Office in writing by August 30. The request for the inclusion of additional matrices and determinands at specific concentration ranges should be included in this request. These requests will be considered by the Advisory Board for the proposed programme. Following acceptance by the Advisory Board they will be included in the scheme programme, provided that there are sufficient participants who wish to undertake the study.


Schematic Diagram of the QUASIMEME International Laboratory Performance Studies for June 1998 to May 1999
Participants receive information on the studies
Annual Report
Advisory Board
Applications from participants
October
Transmission of data to third parties at the participants request
Scientific Assessment Group for annual progress report
Round 14
June to October '98
Groups AQ-1, AQ-2
MS-1 to MS-3
BT-1 to BT-3
DE-1, DE-2
5 months
September
Round 15
October '89 to January '99
AQ-3 to AQ-8
4 months
Submit results Assessment report
Round 16
Dec. '98 to April '99
Groups AQ-1, AQ-2
MS-1 to MS-3
BT-1, BT-2, BT-4
DE-3 & DE-5
5 months
Round 17
April to July '99
AQ-3 to AQ-8
4 months
Data sheet summary
Reports to participants

The Fees for June 1998 to May 1999

There is now NO annual subscription for QUASIMEME. The fee for each group is calculated separately according to the table given below. All payments for the *LP Studies* will be made in ECU. The cost in ECU is calculated with the exchange rate given. The actual cost will be based on sterling and the exchange rate used will be the one in force at the time of invoice.

THE PRICES QUOTED IN THE TABLE ARE VALID UP UNTIL NOVEMBER 30 1998. Any orders received before Nov. 30 1998 for the 1998-1999 QUASIMEME year will be costed using the fee structure given below. The fees are fully inclusive. They include all test materials and replacements through breakage or loss in transit, QUASIMEME helpdesk, assessments and reports, free registration at QUASIMEME Workshops.

THERE IS A DISCOUNT OF 10% ON THE TOTAL AMOUNT FOR LABORATORIES THAT SELECT 10 OR MORE GROUPS.

Fees for the QUASIMEME Laboratory Performance Studies		
	Exchange rate ECU 0.66 at 10.03.98	
No of Groups	Fee per group (£UK)	Fee per group ECU
AQ-1	270	409
AQ-2	290	439
AQ-3	270	409
AQ-4	245	371
AQ-5	245	371
AQ-6	245	371
AQ-7	245	371
AQ-8	245	371
MS-1	280	424
MS-2	280	424
MS-3	280	424
BT-1	310	470
BT-2	310	470
BT-3	370	560
BT-4	310	470
DE-1	360	545
DE-2	360	545
DE-3	360	545
DE-5	360	545
DE-6	270	409

The Subscription Structure of the QUASIMEME *LP Studies* June 1998 to May 1999

Cost of additional samples		
1 sample	£80	120 ecu
2 samples	£140	212 ecu
3 samples	£190	288 ecu
Each additional sample	£60	90 ecu

Questionnaire 2: National and International Interlaboratory Quality Assurance (ILS) Programs Pertinent to the Northern Contaminants Program

PART A: IDENTIFYING INFORMATION

1. Name of Organization Conducting ILS Program R.T. Corporation		
2. Name of ILS Program: RTC Laboratory Proficiency Testing Program (LPTP) for Solids. RTC LPTP for Waters		
3. Name and title of person completing this survey: Robert D. Rucinski. CEO		
4. Contact name and title of contact person for requesting participation in the study or program: JoAnn Kearns. Program Coordinator		
5. Address: R.T. Corporation P.O. Box 1346 2931 Soldier Springs Road Laramie, WY 82073		
Phone: (307) 742-5452	**Fax:** (307) 745-7936	**Email:** RTCrefmat@aol.com

PART B: MATRICES AND PARAMETERS INVESTIGATED

Please tell us what components your quality assurance program involves. What parameters are analyzed and in which matrices (e.g. toxaphene in air, mercury in blood, etc.). What is the target concentration to be analyzed? How many samples are tested for each study? Please give an indication of the schedule of the ILS program (e.g. how many times is the program conducted each year? When do participants receive the results?). Finally, please give an indication of the cost of participation in the study.

6. Specific Parameters of Interest: toxaphene, chlordane, HCHs, congener PCBs, PCNs, radionuclides, methyl mercury, mercury, selenium, arsenic, cadmium, others (Please attach an additional page if required.)					
Parameter (e.g. trace metals, toxaphene, mercury)	**Matrices Investigated (e.g. water, air, sediment, biota, human samples, etc.)**	**Target Concentration Levels**	**# Samples/Study**	**Schedule of ILS Program (# times per year; when is the final report made?)**	**Cost for Participation in the Program**
All potable and waste water parameters	**Water**	**As required by USEPA**	**29/WS 21/WP**	**Final report within 10 days**	**Depends upon level of participation.**
Trace Metals, all	**Soil/Sediment/Sludge**	**Natural Matrix**	**1 to 3**	**10 days**	**Frequency dependent**
Semi-Volatiles	**Soil/Sediment**	**Natural Matrix**	**1 to 2**	**10 days**	**Frequency dependent**
PCBs	**Soil/Sediment/Oil**	**Natural Matrix**	**1**	**10 days**	**Frequency dependent**

7. Additional Comments (e.g. how large is the program; how many labs are involved; from what geographical locations?)

The sized of the programs vary from 20 participants to 420 participants. The programs are somewhat dependent upon geographical location with the majority of participants in the US. Programs are conducted in other countries with mult-national participants.

RTC also produces performance evaluation samples for use by other programs.

Natural matrix materials are used to the greatest extent possible to simulate "real-world" conditions in the proficiency testing.

8. In order to help us complete a most comprehensive listing of available ILS programs, please suggest other contacts or organizations that may provide additional information or quality assurance services.

RIZA
Henk Boekholt
P.O. Box 17
8200 AA Lelystad
the Netherlands
H.Boekholt@riza.rws.minvenw.nl

Please add any other information or comments that you feel would add value to the above survey.

Please return to: Glynn Gomes Tel. (905) 338-2927 Fax: (905) 338-9579 Email: gomesg@globalserve.net

Questionnaire 2: National and International Interlaboratory Quality Assurance (ILS) Programs Pertinent to the Northern Contaminants Program

PART A: IDENTIFYING INFORMATION

1. Name of Organization Conducting ILS Program	Water Technology International Corporation
2. Name of ILS Program:	
3. Name and title of person completing this survey:	Julie Mototsune, Quality Assurance Officer
4. Contact name and title of contact person for requesting participation in the study or program:	Harry Malle, Quality Assurance/Quality Control Scientist OR Julie Mototsune, Quality Assurance Officer
5. Address:	867 Lakeshore Rd. P.O. Box 5068 Burlington ON L7R 4L7

Phone: Harry (905) 336-6442	Fax: both: (905) 336-4427	Email: Harry Harry@rtbrold).Malle@conorp
Julie (905) 336-4741		Julie Julie.Mototsune@conorpac.ca

PART B: MATRICES AND PARAMETERS INVESTIGATED

Please tell us what components your quality assurance program involves. What parameters are analyzed and in which matrices (e.g. toxaphene in air, mercury in blood, etc.). What is the target concentration to be analyzed? How many samples are tested for each study? Please give an indication of the schedule of the ILS program (e.g. how many times is the program conducted each year? When do participants receive the results?). Finally, please give an indication of the cost of participation in the study.

6. Specific Parameters of Interest: toxaphene, chlordane, HCHs, congener PCBs, PCNs, radionuclides, methyl mercury, mercury, selenium, arsenic, cadmium, others (Please attach an additional page if required.)

	Parameter (e.g. trace metals, toxaphene, mercury)	Matrices Investigated (e.g. water, air, sediment, biota, human samples, etc.)	Target Concentration Levels	# Samples/Study (# of labs that are sent the sample; # of samples of each different concs?)	Schedule of ILS Program (# times per year; when is the final report made?)	Cost for Participation in the Program
1. CAEAL	BOD Suspended Solids	water "	10 - 200 mg/L not available (~50-110 mg/L)	~160, 4 levels ~175	2 times/year CAEAL "	confidential - CAEAL program
	pH PAH's	" "	2-11 0.2 - 10 µg/L	~130 ~40	" "	
	PCB's + pesticides Volatiles	" "	PCB's 0.1-10 µg/L pest. 0.02-1.0 µg/L BTEX 10-100 µg/L, THM 25-300 µg/L	~ " "	" "	
	PAH's	solid	0.5 - 10 µg/g	~20	"	
2. Brazil	TKN + TP BOD	Water "	TKN as N 0.9-23 mg/L, TP as P 1.5-46 mg/L 15-80 mg/L	~30, 4 levels "	Brazilian round robins twice/yr "	Cost is unknown to me.
	COD Solids (Suspended, Volatile, ...)	" "	~30-160 mg/L 50-110 mg/L	" "	" "	
	Anions Metals	" "	~0.2 - 158 mg/L ?	" "	" "	
	pH	"	2-11	"	"	
3.	Hydrocarbons	solid	to be determined	to be scheduled		to be determined

* no other lab participation is allowed outside CAEAL program. I have included information pertaining to this study, to demonstrate our capability in this area should the need arise for a round robin study in this area. i.e. "when a batch of samples for analysis are produced for CAEAL the entire batch must be used for CAEAL. However, WTI can make a separate batch for use in a separate round robin study.

7. Additional Comments (e.g. how large is the program; how many labs are involved; from what geographical locations?)

CAEAL - Canada-wide

Brazil - ~30 labs involved, other participation has been included with this study, however, response from Brazilian labs is slow ∴ report is produced ~ 4-5 months after release of sample.

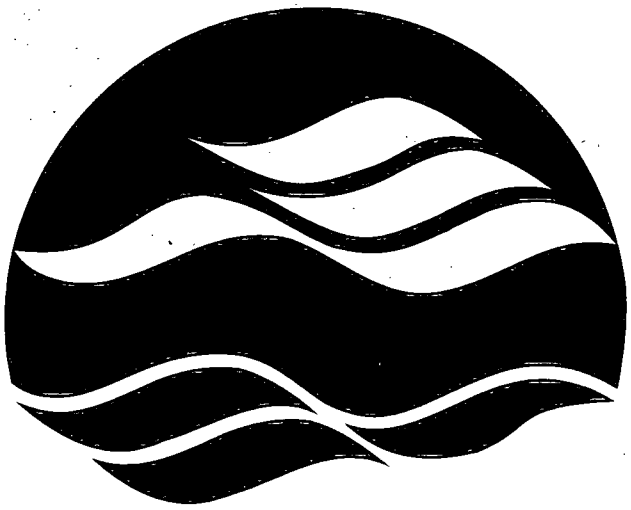
Hydrocarbons - this is a new study - labs across Canada will be invited to participate

8. In order to help us complete a most comprehensive listing of available ILS programs, please suggest other contacts or organizations that may provide additional information or quality assurance services.

Please add any other information or comments that you feel would add value to the above survey.

Please return to: Glynn Gomes Tel. (905) 338-2927 Fax: (905) 338-9579 Email: gomesg@globalserve.net

Appendix C:
Supplementary Information and Corporate Literature



NATIONAL WATER RESEARCH INSTITUTE

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Canada S7N 3H5

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Environment Canada Environnement Canada

Canada