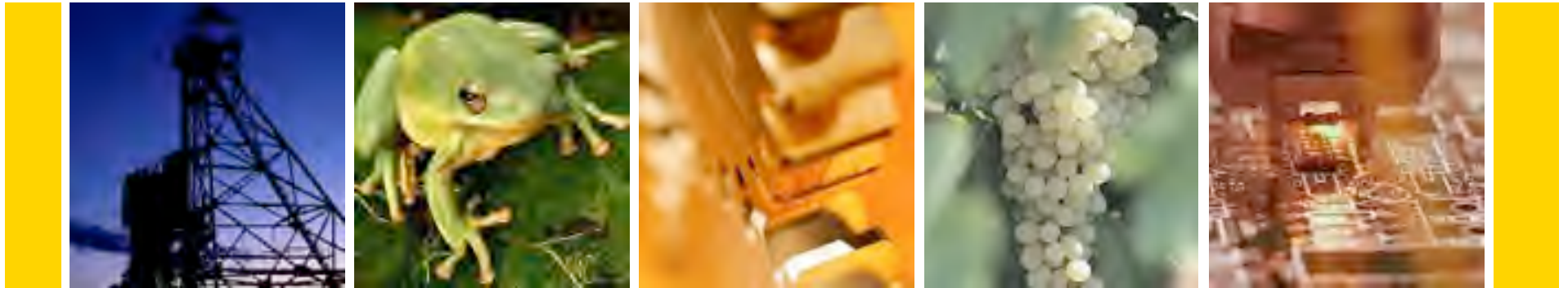


ALS Laboratory Group

ANALYTICAL CHEMISTRY & TESTING SERVICES



Working Effectively with the Mineral Analysis Laboratory

*Right solutions....
....Right partner*

The Lab is Part of the Team

- **significant costs are involved in collecting geological samples for analysis**
- **significant decisions are made based on the data provided by mineral analysis laboratories.**
- **it is critical to work effectively with your laboratory and to consider the lab as part of your exploration team**



6 Recommendations

- **to help improve your experience when working with any mineral analysis laboratory**
- **to help improve your own due diligence**
- **to help ensure your expectations are met**
- **common sense but sometimes overlooked**



Communication

**For optimal project outcome,
communicate with your laboratory**

- **before the project starts**
- **during the project**
- **after the project**





Recommendation # 1

Understand & Verify Laboratory Statements Regarding

- Registration,**
- Certification &**
- Accreditation**



Statements from Relevant Regulations & Related Guidelines

- “Describe ... **whether the laboratories are certified** by any standards association and the particulars of any certification”
 - *NI 43-101 Technical Reports (NI 43-101F1)*
- “The **accreditation of each laboratory**, or lack thereof, **must also be disclosed.**”
 - *Disclosure Standards for Companies Engaged in Mineral Exploration, Development & Production, Toronto Stock Exchange*
- “**Analysis and testing of samples should be done by a reputable and preferably accredited laboratory** qualified for the particular material to be analyzed or tested.”
 - *Mineral Exploration Best Practices Guidelines, CIM, June 2000*



Misleading Information?

- NI 43-101 requires that a “qualified person” does not issue misleading information in news releases or technical reports
- Understand and verify laboratory statements involving the terms “registration”, “certification” & “accreditation” as part of your laboratory selection process and in disclosure of mineral projects



2 Types of Independent Verification

- **ISO 9001 Registration / Certification**

- proof that Quality Management System meets international best practices
- for specific scopes of activity & geographic locations
- DOES NOT evaluate the analytical capability of the lab



- **ISO 17025 Accreditation**

- proof of technical capability to perform specific tests
- 2 components
 - audit of analytical methods & technical capability (every 2 yrs)
 - analysis of proficiency test samples (every 6 months)
- for specific analysis methods & geographic locations





Recommendation # 2

Visit the Laboratory



Personal Visit to the Laboratory

- **Essential part of due diligence**
- **Tour the preparation, analysis, and sample storage areas**
- **Understand how samples are managed to minimize loss and mix-ups**
- **Trace final result back to original samples through audit trail**
- **Meet key contacts**
- **Observe cleanliness, organization, H&S, space & security**
- **Helps improve communication with the lab**





Recommendation # 3

**Choose Appropriate
Methods for
Preparation and Analysis**



Method Selection - Preparation

- **THE MOST CRITICAL STEP IN THE ANALYSIS PROCESS**
 - watch for organization and contamination control
- **Lab must produce a homogenous analytical subsample fully representative of the material submitted**
- **Several options available for**
 - **Rock / Core** - particle size & distribution, amount pulverized
 - **Soil / Sediment** – separate size fractions (sieve / screen) or pulverize
- **Discuss options with lab before submitting samples**



Sample Preparation – Quality Control

- **Prepared particle size monitoring**
 - to ensure required specification (geostatistical control) is met consistently
 - lab should provide proof
 - erratic crushed or pulverized particle size can lead to erratic analysis results
- **Project Specific or External QC Protocols**
 - frequency & type (crushed or pulverized) of prep duplicates
 - additional crusher or pulverizer cleaning
 - insertion of standards & blanks (in field or at lab)



Method Selection - Analysis



1. Decomposition



2. Analysis



Sample Decomposition - Options

- **Aqua Regia (partial) Digestion**
 - least expensive and good for initial investigation or looking for trends
 - may not provide full recovery of base metals
- **4 Acid (near-total) Digestion**
 - more expensive but dissolves most minerals
- **Fusion (total)**
 - best recovery for metals that don't dissolve well in acid like Rare Earth Elements (REEs)
- **Fire Assay Fusion** – precious metals
- **Recovery of specific elements by any decomposition method depends on the sample matrix & mineral form**

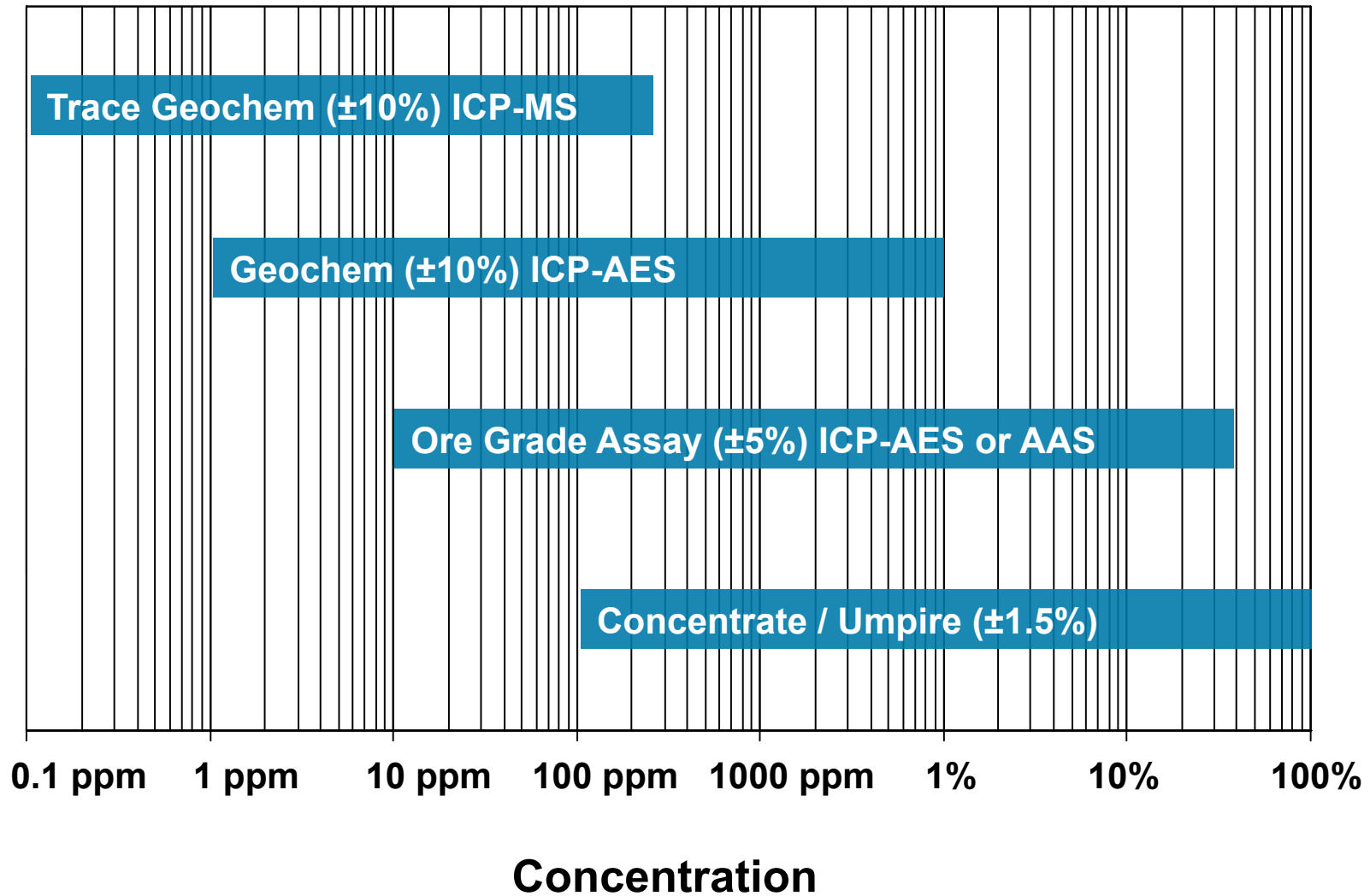


Sample Analysis - Considerations

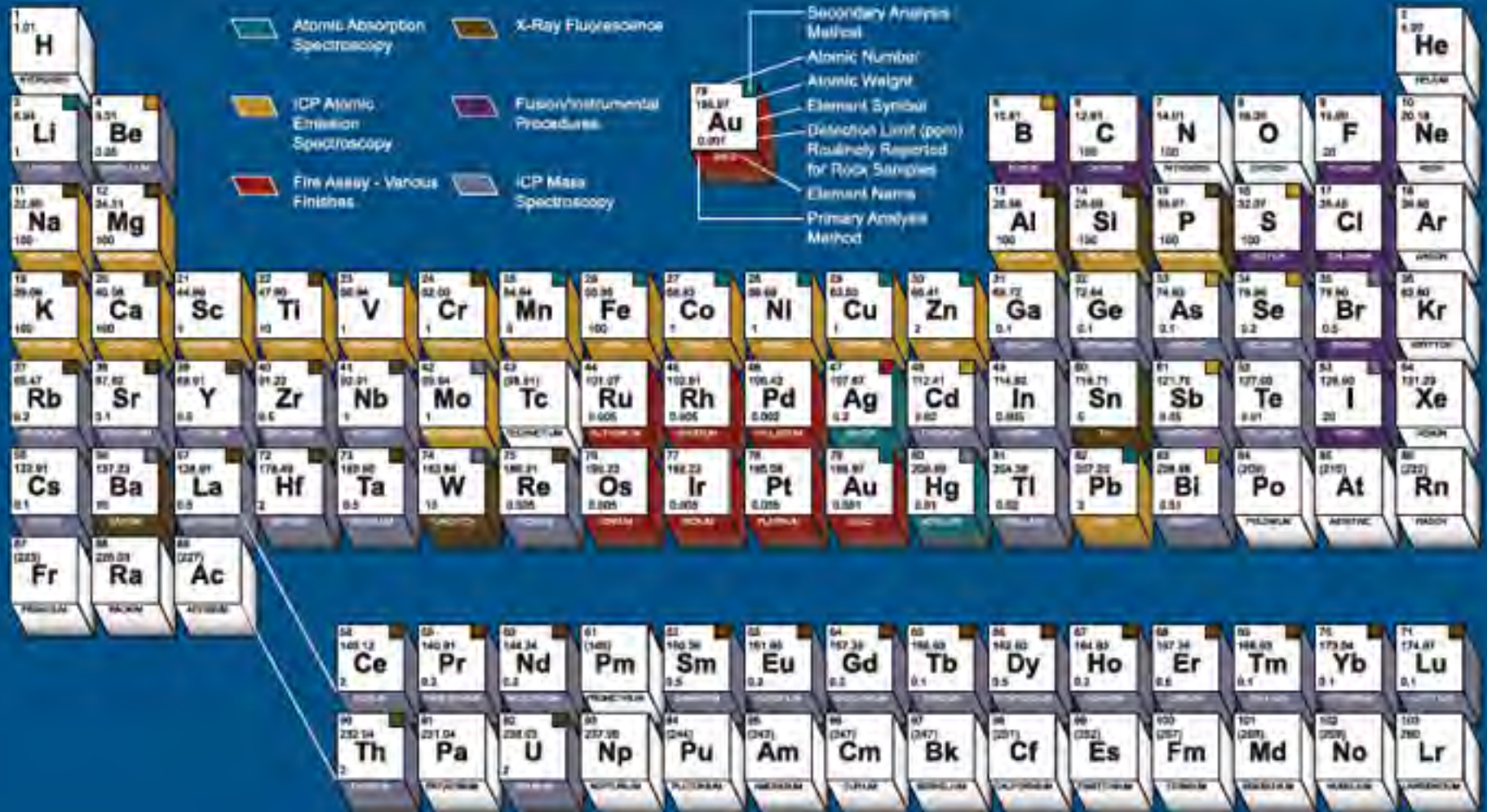
- **Elemental Coverage**
 - single or multi-element (future use of data)
- **Reliability**
 - Geochemical ~ +/-10% precision (grassroots)
 - Ore Grade ~ +/-5% precision (resource)
 - Umpire or Concentrate ~ +/-2% precision (trade)
- **Detection Limits (DL) and Upper Range**
 - Lower Limit of interest (DL should be 50x lower)
 - Expected Upper Limit
 - if concentration is too low or too high for the method results may be unreliable



Method Range for Copper



Preferred Methods of Analysis for Geological Materials



Method Selection - Summary

- All methods have limitations to some degree
- Discuss objectives with the lab before submitting samples to determine the most appropriate analysis methods
- Compare methods with a small set of duplicate samples
- The geologist is responsible for selecting methods suitable for the project – the lab can only provide suggestions





Recommendation # 4

**Submit Samples Securely
with Clear Identification &
Instructions**



Sample Packaging & Shipping



Sample Submission

- **Unclear identification & instructions will cause delays**
- **Use of Sample Submittal Form**
 - **Contact info**
 - Quote & PO #
 - Sample type – matrix & grade (trace or ore)
 - Sample ids & number
 - Analysis methods required – lab codes or description
 - Special instructions & RUSH requests
 - Data & invoice distribution and formats
 - Sample disposition – store, return, dispose
- **Identify any high grade or unusual samples**



Sample Submission - Suggestions

- **notify lab as soon as possible that samples are coming in so that resources can be allocated**
- **group and package samples in sequential order**
- **number multiple shipment containers**
- **clearly mark the bag or box that contains the submittal form and first samples**
- **also email sample submittal form or sample ids in digital form help minimize transcription errors**
- **Rush Analysis Requests**
 - Notify lab prior to shipping samples
 - Package RUSH samples separately from routine
 - Clearly mark **RUSH** on OUTSIDE of bag





Recommendation # 5

**Evaluate
Quality Control (QC) Data
in Real Time**



Data Evaluation

- **For a comprehensive understanding of the data you need to evaluate both**
 - your (external) QC results
 - the lab's (internal) QC results
- **You should question QC data that falls outside of acceptable ranges**
- **Evaluate the quality of each batch of data as it is received so modifications to the process can be made if necessary**
- **Work with the lab as part of your team to resolve any issues**





Recommendation # 6

Communicate Effectively With the Lab



Communication

- **2 way, timely, communication is critical to the success of any project**
- **Get to know your contacts at the lab**
 - Client Service Team
 - Quality Control Team
 - Management Team
- **Provide your contact options**
- **Feedback on service and data through the season – don't wait until it's too late**





Working Effectively with the Laboratory - Summary

1. Understand & verify lab statements regarding registration, certification & accreditation
2. Visit the Laboratory
3. Choose appropriate methods
4. Submit samples securely with clear identification and instructions
5. Evaluate QC data in real time
6. Communicate effectively with the lab

