1.0 Purpose

This procedure describes how measurement traceability is maintained and measurement uncertainty is calculated and used within the laboratory. The laboratory uses annual equipment calibration, control charts, and standards validation to ensure traceability of measurements. The laboratory uses the data obtained from measurement traceability to calculate uncertainty associated with final test results.

2.0 Discussion

The laboratory uses the measurement uncertainty to accurately represent the final results reported to the customer. The laboratory investigates practices that effect measurement uncertainty and their impact on the final result. As part of the laboratory's commitment to quality, trends that have the potential to adversely affect the quality of laboratory data, are investigated and resolved.

3.0 Definitions

3.1 Measurement Traceability: Property of a measurement result whereby the result can be related to a reference through a documented unbroken chain of calibrations, each contributing to the measurement uncertainty

3.2 Measurement Uncertainty: A parameter associated with the result of a measurement that characterizes the dispersion of the values that could reasonably be attributed to the measurand

3.3 Confidence level: The percentage of normally distributed values included in the final estimate given

3.4 Guide to Uncertainty of Measurement (GUM): Standardized method for evaluating, estimating, and expressing measurement uncertainty

3.5 Standard Deviation (sd): The root of the mean of the squares of the differences from the average

3.6 Certified Reference Material (CRM): Reference material, accompanied by documentation issued by an authoritative body and providing one or more specified property values with associated uncertainties and traceabilities, using valid procedures

4.0 Procedure

4.1 Measurement Traceability

4.1.1 The Quality Manager is responsible for ensuring all equipment with measuring functions used for final results maintain a current calibration.

4.1.2 Information regarding equipment calibration, to include specifications for the calibration laboratory, specified requirements for the calibration, and the interval of calibration, is documented on the equipment list, QD008.

4.1.3 The Laboratory Manager approves any extension in the interval of calibration.

4.1.4 Equipment that has a significant effect on the accuracy or validity of a test result or the total uncertainty of the test result, requiring a calibration is calibrated by ISO/IEC 17025:2005 accredited providers with a scope of accreditation covering the calibration performed.

4.1.5 The supplier of external calibration services used is to be accredited to ISO/IEC 17025:2005 by an accrediting body that is a signatory to the ILAC MultiLateral Recognition Arrangement or the ILAC Mutual Recognition Arrangement or be evaluated for competence, measurement capability and traceability. This evaluation shall be reviewed and approved by the Quality Manager before use of the supplier.

4.1.6 When equipment does not have a significant effect on the test result the Quality Manager determines if a calibration is maintained and the requirements for the calibration.

4.1.7 If a certified reference material (CRM) is altered so the traceable measurement value is changed then the equipment used for the alteration is subject to the calibration requirements outlined in 4.1.1 to 4.1.6. When a CRM is used in conjunction with a measuring system for establishing traceability then the measuring system is not subject to sections 4.1.1 to 4.1.6.

4.1.8 CRM is supplied by a National Metrology Institute (NMI) or from an accredited Reference Material Producer (RMP) that is accredited to ISO Guide 34:2009 by an accrediting body that is ILAC recognized and with a scope covering the CRM. If the CRM is from an RMP that does not meet the above guidelines then it is evaluated for competence and traceability. The Quality Manager reviews this data and approves the CRM before use.

4.1.9 If reference standards require calibration the procedures listed in 4.1.1 to 4.1.6 apply.

4.1.10 Procedures for quality control checks are outlined in the technical procedures. Data obtained from these quality control checks are maintained using control charts.

4.1.11 An approved vendor list is maintained for suppliers of calibrations of equipment or reference standards, suppliers of reference standards and suppliers of reference materials to confirm the supplier meets the specifications of the laboratory. An evaluation of each supplier is documented on the List of Approved Vendors, QD009.

4.1.12 Records of calibrations, vendor reviews, and approvals are maintained.

4.2 Measurement Uncertainty

4.2.1 Measurement uncertainty is estimated when values are reported for: 1) the quantity (weight or volume) of a controlled substance evidence or the quantity of a controlled substance when reported as a weight or volume fraction (purity) of the whole; 2) the concentration (weight or volume fraction) of a drug in a toxicology sample, including values reported for blood alcohol; 3) the barrel length of a firearm and/or the overall length of a firearm; and 4) the calibration of breath alcohol measuring instruments and calibration of breath alcohol reference materials.

4.2.2 The coverage probability of the expanded uncertainty is 99.8% (or $\pm$ 3 standard deviations).

4.2.3 Specific procedures for estimating measurement uncertainty are outlined in the individual technical SOPs.

4.2.4 The estimation of measurement uncertainty performed is documented on the Measurement Uncertainty Form, TF202.10.5 and approved by the Quality Manager before publishing.

4.2.5 Measurement uncertainty is reported in the test report or an attachment when it impacts the evaluation of a specification limit stated by a regulatory body, a statute, case law or other legal requirement. Measurement uncertainty is expressed as an expanded uncertainty including the coverage probability of 99.8% and is reported as y $\pm$ U, where y is the result and U is the uncertainty, with consistent units and level of significance.

5.0 Health and Safety

There are no specific health or safety requirements associated with this procedure.

6.0 Records Management

The Quality Manager is responsible to ensure the proper storage, backup and retention of all laboratory records in accordance with procedure QP101.13, Quality and Technical Records.

6.1 Equipment calibrations, current and historical.
6.2 Uncertainty estimates, current and historical.
6.3 Vender reviews, current and historical.
6.4 Email communications.

7.0 References

7.1 ASCLD/LAB Policy on Measurement Traceability, AL-PD-3057 Version 1.1
7.2 ASCLD/LAB Policy on Measurement Uncertainty, AL-PD-3060 Version 1.1

8.0 Appendices

None

9.0 Revision Table

Revision #	Effective date	Revised by	Description of Revisions
Original Issue	12/30/2013	A. Hutson	

Authorization

This Standard Operating Procedure, Original Issue, has been approved and authorized by:

Bethany P. Pridgen, MFS Forensic Lab Manager	Date
Ralph M. Evangelous Chief of Police	Date