UNITED STATES DEPARTMENT OF COMMERCE
National Institute of Standards and Technology
Gaithersburg, Maryland 20899-

October 29, 2024

MEMORANDUM FOR: C-RMAP Participants and Laboratory Directors

From: Micheal Hicks *Micheal Hicks*
Laboratory Metrology Program
Office of Weights and Measures

Subjects: 2025 Combined Regional Measurement Assurance Program (C-RMAP) Training

You are cordially invited to register and attend the NIST OWM 2025 CRMAP training. Every year, NIST OWM works with a state lab host to provide training and networking opportunities for state lab participants according to NIST Handbook 143. This usually occurs in each of the six US Regional Measurement Assurance Program (RMAP) geographical areas throughout the year. Every five years NIST OWM combines these individual RMAP meetings into a single combined RMAP (C-RMAP) training and networking event for all RMAP participants. This C-RMAP meeting will occur in 2025. NIST OWM encourages participating labs to send as many metrology staff members as possible to take full advantage of this opportunity and to ensure full coverage during the concurrent training sessions to get a maximum productive outcome from attending this event for your laboratory. Training sessions are duplicated where possible but one person will not be able to attend all sessions. The technical topics and schedule overview are provided below in the Agenda at a Glance and Abstracts and Learning Objectives Sections. The 2025 training events have been scheduled as noted in the below Agenda at a Glance. Training topics have been selected based on observed and requested training needs, observations from laboratory assessments, and annual reviews of submitted data and proficiency testing results. The C-RMAP sessions are generally held with breakout sessions for each regional group, and the technical sessions are held concurrently, so the sessions and times that are most applicable to your laboratory will need to be selected in advance. Most of the sessions will be a general session for all attendees or will be held multiple times to enable attendance.

Weights and Measures participants:
NIST Handbook 143, Table 2 notes that annual attendance at the RMAP training session is required for ongoing laboratory recognition by NIST OWM. Handbook 143, Program Handbook details the criteria used for OWM Laboratory Recognition. In addition, participation in ongoing RMAP proficiency tests (PTs) requires completion of training requirements to the designated level and attendance at the annual RMAP training sessions.

Non-Weights and Measures Participants:
Participation in the training sessions at this event is open to everyone who is registered. If you are a regular attendee of the RMAP training sessions *and* have completed training at the requisite levels, you may participate in the national and regional proficiency tests coordinated by the NIST Office of Weights and Measures. Additional NIST laboratory metrology training opportunities are posted here: https://www.nist.gov/pml/owm/laboratory-metrology/lab-metrology-training.

Hotel:
Onsite registration and all associated training events will be held at the DoubleTree by Hilton Portland Hotel in Portland, OR. When reserving your room, call in with this group code “CRMAP 2025” or visit the hotel’s website and use code CDTCRM. The group nightly rate ($155.00 + tax) is available until May 1, 2025 (subject to availability) for dates between May 31, 2025 and June 8, 2025. Advise Steve Harrington

(steven.harrington@oda.oregon.gov) as soon as possible regarding any concerns related to reservation difficulties.

DoubleTree by Hilton Hotel Portland
1000 NE Multnomah Street
Portland, Oregon 97232 USA
503-281-6111

The hotel reservation can also be made by using the following link https://www.hilton.com/en/book/reservation/rooms/?ctyhocn=RLLC-DT&arrivalDate=2025-06-01&departureDate=2025-06-07&groupCode=CDTCRM&room1NumAdults=1&cid=OM%2CWW%2CHILTONLINK%2CEN%2CDirectLink.

Registration:
Registration consists of the following two steps.

Step 1: Registration for the Combined Regional Measurement Assurance Program with course number 78 training event in the OWM Contacts System (https://www.nist.gov/pml/owm/owm-training-and-events).

Register for C-RMAP using the Office of Weights and Measures Contact System (https://owm.nist.gov/s/). You must register in the OWM Contact System to participate in the training. Follow the instructions to create an account unless you are already a registered user. If you have any questions, please contact Yvonne Branden at yvonne.branden@nist.gov.

Step 2: Pay the conference registration fee. You may pay online or by using the included registration form. The registration fee covers all costs associated with the meeting and applies to each attendee.

Registration Type	Amount	Deadline	Payment Links	Included in Registration
Early	$450	April 1, 2025	https://tinyurl.com/CRMAP2025	Access to technical sessions, reception on Sunday, and dinner on Thursday
Late	$475	June 1, 2025	https://tinyurl.com/CRMAP2025	
Guest (dinner and reception only)	$30	June 1, 2025	https://tinyurl.com/CRMAPGuest2025	Access to the reception on Sunday and dinner on Thursday
Exhibitors	$500	May 19, 2025	https://tinyurl.com/CRMAP2025Exhibitor	6-foot table top exhibit space from June 1 to June 5 and access to technical sessions for one person and Sunday reception and Thursday dinner for one person

If you are not able to complete payment via the provided payment link, please use the registration form at the end of this memo to request an invoice and email it to crmap_2025@outlook.com or mail it to the below address:

Regional Measurement Assurance Association LLC,
1144 Wallace Rd NW #255
Salem, OR 97304.

The point of contact for registration through WWMA is Steven Harrington (steven.harrington@oda.oregon.gov).

Schedules:
The schedule, location, and contact host for the C-RMAP training event are listed below. The agenda and detailed learning objectives are in the following sections.

Region	Dates	City, State	Host
C-RMAP	June 1 to 5, 2025	Portland, OR	Steven Harrington Steven.harrington@oda.oregon.gov 503-931-3156

Agenda at a Glance:
Sessions will be held Monday through Thursday from 8:00 am to 4:30 pm each day. Successful completion requires full attendance and participation in group activities. If any participants leave early, attendance certificates will be adjusted accordingly and full attendance is required according to Handbook 143 by at least one staff member of the laboratory for full Recognition eligibility. The following page provides the agenda at a glance.

Combined Regional Measurement Assurance Program (C-RMAP) 2025 Agenda

<table>
<tr><th>Sunday, June 01, 2025</th><th>Monday, June 02, 2025</th><th>Tuesday, June 03, 2025</th><th>Wednesday, June 04, 2025</th><th>Thursday, June 05, 2025</th></tr>
<tr><td></td><td colspan="4">Morning Sessions 8:00 am to 11:30 pm
Tuesday through Thursday sessions are concurrent 3.5-hour sessions. You must choose ONE session for each Block.</td></tr>
<tr><td rowspan="4"></td><td rowspan="4">Sisters/Bachelor

Opening and Overview of What’s New in State Lab Program
&
National PT Reports
(Hicks, Koncki)

Breakouts for all RMAP Groups
PT Review and Planning</td><td>Oregon
Electric Vehicle Supply Equipment
Gruneisen, Delak</td><td>Oregon
Intermediate Excel for the Lab, II
Corn, Smetana</td><td>Oregon
Realization of the Kilogram and the Consensus Value
Kubarych, Chestnutwood, Hicks</td></tr>
<tr><td>Mt. Hood
Common Non-conformities with ISO/IEC 17025:2017 and NIST Handbooks
Knake, Koncki</td><td>Mt. Hood
Length
Torres, Hicks</td><td>Mt. Hood
Common Non-conformities with ISO/IEC 17025:2017 and NIST Handbooks
Knake, Koncki</td></tr>
<tr><td>Adams Jefferson
Balance and Scale Calibration and Uncertainty Part I
Ruefenacht, Hicks</td><td>Adams Jefferson
Thermometry: Calibration & Uncertainties Part I
Rogers, Herman</td><td>Adams Jefferson
Time & Frequency
Claycomb, Garding</td></tr>
<tr><td colspan="4">LUNCH – On Your Own</td></tr>
<tr><td>Portland
Registration
12:00 pm to 5:00 pm</td><td colspan="4">Afternoon Sessions 1:00 pm to 4:30 pm
Tuesday through Wednesday sessions are concurrent 3.5-hour sessions. You must choose ONE session for each Block.</td></tr>
<tr><td rowspan="4">Sisters/Bachelor

Welcome and Agenda Review
(Koncki)

CALM Metrology
(Corn & Smetana)

4:00 pm to 5:00 pm</td><td rowspan="4">Breakouts for all RMAP Groups
Round Tables (cont.)

CaMAP – Portland
NEMAP – Hawthorne
MidMAP – Adams Jefferson
SWAP – Oregon
SEMAP – Sellwood
WRAP – Ross Island</td><td>Oregon
Statistics, Measurement Assurance, and Uncertainty in Mass Calibrations
FitzRysler, Herman</td><td>Oregon
Introduction and Examples of Decision-Making Rules/Process (scope, gap analysis, and justification)
Ruefenacht, Corn</td><td rowspan="4">Sisters/Bachelor

Closing Session

NCSLI 2024 SLP Workload Survey
(Corn)

State Laboratory Program: Strategic Program Review and Input
(OWM)</td></tr>
<tr><td>Mt. Hood
Basic Excel for the Lab, I
Smetana, Corn</td><td>Mt. Hood
Volume LPG (SOP 21) Calibrations
Koncki, Pierce</td></tr>
<tr><td>Adams Jefferson
Balance and Scale Calibration and Uncertainty Part II (Plus PT)
Ruefenacht, Hicks, Palmer, Ciesniewski</td><td>Adams Jefferson
Thermometry: Calibration & Uncertainties Part II
Rogers, Herman</td></tr>
<tr><td>Oregon
Reception and Networking:
5:00 pm to 7:00 pm</td><td colspan="3">Dinner – Own your own</td><td>Hood/Helens
Group Dinner and Awards
6:00 pm to 9:00 pm</td></tr>
</table>

** Registration is required.*

Abstracts and Learning Objectives:

MONDAY

Overview of What's New in the State Lab Program: OWM staff

This session will provide a status report on all current drafts/updates on program handbooks and procedures under revision or recently published along with guidance on how to provide input to draft documents and their development and acceptance. Also, a status report on the digitization of paper documentary standards utilized in the field of Metrology.

National PT Reports: OWM staff

Most Proficiency Tests are coordinated within each of the Regional Measurement Assurance Program groups, but some are coordinated on a national level. National PTs include the 100 gal prover, 500 lb standards, precision mass calibrations (Echelon I), and gravimetric volume calibrations.

RMAP Breakouts: facilitated by each RMAP group

Regional Measurement Assurance Program "round table" discussions will be held to capture laboratory updates and changes associated with staffing, facilities, procedures, equipment, standards, and accreditation topics. Laboratory round table sessions help to identify major trends and changes among the laboratory community. Reports focus on changes and challenges related to staff, facilities, equipment, supplier evaluation, standards, operations, economic/workload issues, and regional trends to raise awareness and encourage networking for problem solving. These items are specific to Handbook 143 and the ISO/IEC 17025, Sections 6.2, 6.3, 6.4, 6.5, and 6.6. Participants will be able to IDENTIFY and DESCRIBE regional trends and issues to their laboratory management and other laboratory staff. Also, proficiency testing results will be presented by the PT coordinators with analyses and corrective actions discussed among participants. Planning is done to ensure that every laboratory has a PT available to cover every area of their scope on a roughly four year or more cycle where practicable. PT Plans must be available for every laboratory and are a Recognition and Accreditation Requirement (every recognized and/or accredited laboratory must have a PT Plan available for their Recognition and/or Accreditation Body). Participants will ensure that the regional plan meets their own laboratory requirements. At the end of this session, participants will be able to LIST all the proficiency tests that are being coordinated nationally and within the region that are applicable for their laboratory and DESCRIBE at least one new method/approach for PT analysis. Each RMAP will also hold its business and planning meeting.

TUESDAY

Calibration of Electric Vehicle Supply Equipment and Traceability: Tony Gruneisen (California) and Katya Delak (NIST)

This session will cover the effort being coordinated within the state lab program and NIST on the development of processes for calibrating Electric Vehicle Supply Equipment (EVSE) for electric vehicle charging stations. After this session, participants will be able to identify the traceability hierarchy for EVSE field standards; explain the processes developed by NIST and state labs to maintain traceability to the SI of EVSE field standards; evaluate an EVSE field standard calibration certificate for traceability to the SI; and apply laboratory standards to evaluate and calibrate EVSE Field standards. Participants will be able to IDENTIFY traceability hierarchy for EVSE equipment, UNDERSTAND the current challenges for EVSE equipment and the required skill sets for EVSE calibrations; and EVALUATE traceability data for AC and DC calibration standards.

Common Non-conformities with ISO/IEC 17025:2017 and NIST Handbooks Robert Knake (NVLAP) and Els Koncki (OWM) (held twice)

The ISO/IEC 17025:2017 standard has been required for labs to adopt and implement since 2020. NIST Handbook 150 and NIST Handbook 143 have recently been updated and labs and assessors are working

toward the implementation of the standards. This session will provide the latest information about what gaps and corrective actions have been identified during on-site and remote laboratory assessments. Hear from NVLAP staff and assessors about the top non-conformities that have been observed. At the end of this session, participants will be able to IDENTIFY the top non-conformities and be able to DISCUSS ways and procedures to mitigate non-conformities in their laboratory.

Balances and Scales Calibration and Uncertainty Part I and Part II: Mark Ruefenacht (NIST), Mike Hicks (NIST), Jim Palmer (Sartorius), and Ian Ciesniewski (Mettler Toledo)

This two part session will cover the calibration and use of analytical weighing instruments (balances and laboratory/bench-top scales), including sources of weighing errors in analytical environments, methodologies for quantifying the errors, and computation of balance calibration uncertainty and global (user) uncertainty. Attention will be given to error sources, selection of reference standards, and calibration procedures used in the weighing industry. Part I will review the components of weighing instruments and how they are calibrated. Part II will review the uncertainty components of the calibration methods along with best practices. Participants (and qualified CRMAP attendees) will also have the opportunity to register and demonstrate their proficiency with balance calibrations via an onsite Proficiency Test. Certificates of successful PT completion will be provided for those participants who successfully demonstrate the required knowledge and proficiency. Balances, scales, and mass standards will be provided for this session. Handbooks, reference materials, forms, data sheets, calculations, or any other tools needed for a successful PT must be provided by participants. Participants will be able to BRAINSTORM, CATEGORIZE, and QUANTIFY potential error sources and uncertainty contributors to weighing devices; SELECT the appropriate reference standards for the calibration of weighing instruments; SELECT the appropriate international or national method/procedure for the calibration and/or use of weighing instruments in the ISO/IEC 17025 or regulatory environment; SUMMARIZE the principles and concepts of measurement traceability, measurement assurance, and measurement uncertainty. EXPLAIN the interrelationships between traceability, measurement assurance, and measurement uncertainty; CONSTRUCT a procedure or outline for a balance calibration; DESCRIBE the NIST Eight-Step Process of Measurement Uncertainty Estimation applied to weighing instrument calibration and/or use; DEVELOP a basic uncertainty budget for weighing devices that is validated with the principles of measurement assurance; and ESTIMATE the minimum sample quantity for weighing instruments.

Statistics, Measurement Assurance, and Uncertainty in Mass Calibrations: Benjamin FitzRylser (Minnesota) and Tobias Herman (NIST)

Statistics provides key tools used to assess mass calibration processes and estimate measurement uncertainties. This session reviews the role of statistics in mass calibrations common to legal laboratory metrology via exploration of the relevant equations (including Excel formulas) and easy to use approaches to estimating statistical values. It also explores their use in measurement assurance, and demonstrates examples of their use in contributing to the quantification of uncertainties. Participants will be able to EXPLAIN common statistical approaches and tools available to assist with evaluating processes and estimating uncertainties in mass metrology and APPLY quantitative and qualitative tools for measurement assurance via control charts.

Basic Excel for Metrology, Level I: Kate Smetana (Colorado), Lisa Corn (Texas)

Starting with Software Verification and Validation requirements, this session will cover good practices for layout, design, and assessment of spreadsheets used in the metrology laboratories and then use basic Excel functions and equations to perform basic statistical calculations for descriptive and comparative data analysis. Learning objectives will include participants being able to do the following in their own laboratory: DESIGN and DEVELOP a spreadsheet using an outcome based intention; ASSESS a spreadsheet

using a software V & V template both during and after development; IMPLEMENT several simple tools, job aids, and references to use within laboratory operations including the calculation and use of fundamental statistical tools and functions for calculating average, standard deviation, F-test, the t-test, E_n, and P_n values. Participants will need to be familiar with Excel layouts and structure (cell identifications) and know how to enter basic equations in Excel. This will be a demonstration and hands-on session - participants will be expected to complete learning objectives and practice activities.

WEDNESDAY

Intermediate Excel for the Lab, Level II: Lisa Corn (Texas) and Kate Smetana (Colorado)

This session will build on good practices for layout, design, and assessment of spreadsheets used in the metrology laboratories and then use more advanced Excel functions and equations to work with IF statements, nested IF statements, Look-up tables, and equations commonly used in uncertainty calculations which can also be applied to other metrology examples. This session will introduce participants to logical operations as they relate to If/Then structures within Excel; introduce participants to Excel lookup tables and how they can be used in the metrology laboratory; and explore how these concepts can be used with other built-in Excel functions to simplify uncertainty calculations and improve effectiveness and efficiency in the laboratory. Participants need to be familiar with Excel layouts and structure (cell identifications), know how to enter basic equations in Excel, and be familiar with the equations and content covered in the Basic session. At the end of this session, participants will be able to APPLY IF statements, LOOK-UP tables, and more advanced equations (RSS, SUMPRODUCT, SUMSQ, Welch-Satterthwaite, etc.) used in Uncertainty analyses. This session will not cover the use of visual basic or macros. This will be a demonstration and hands-on session - participants will be expected to complete learning objectives and practice activities. (Participants should have covered Software V & V in Fundamentals of Metrology, the OWM Software V&V webinar, or at least read the Software QA procedure that is posted at this link (prior to the session): https://www.nist.gov/sites/default/files/documents/2018/01/12/procedure-for-software-qa-20180101.pdf.

Length Calibration and NISTIR 8028, Jose Torres-Ferrer (NIST) and Mike Hicks (NIST)

In this session, Standard Operating Procedures (SOPs) from the NISTIR 8028, Selected Laboratory and Measurement Practices and Procedures for Length Calibrations will be reviewed for calibrating rigid rules, measuring tapes (bench method & tape-to-tape), and pi-tapes, including data reduction and uncertainty calculation. Control-charting and report generation will also be discussed. Learning objectives: Participants will be able to follow the procedures to COMPARE an unknown length artifact to a physical standard, CALCULATE the measurement error and uncertainty, and GENERATE a calibration report that complies with ISO/IEC 17025:2017, Section 7.8. This session will include hands-on calibration activities.

Thermometry Calibration, Uncertainties, and Devices Part I and Part II: Toby Herman (NIST) and Robert Rogers (North Carolina)

Temperature is an important measurement parameter that plays a role in most fields of metrology. In the Part I session, we will discuss the key aspects of a thermometer calibration program, including what is involved in setting up and operating a lab. We will also discuss how and why you might add resistance thermometry to your scope and go over some examples of uncertainty budgets for temperature calibrations. By the end of this session, participants will be able to DESCRIBE the necessary elements of a thermometer calibration program, EVALUATE instrumentation for establishing and running a thermometer calibration laboratory, and ASSESS whether their laboratory could or should include thermometry in its scope.

In the Part II session, we will discuss the technical aspects of contact thermometry, including the use and care of resistance thermometers (including thermistors), thermocouples, and liquid-in-glass thermometers. We will cover how we define temperature, and how we convert raw thermometer data into calibration coefficients. We will finish this session by realizing an ice-point using materials and methods available in any laboratory; the way we realize this fixed point is generally reproducible to about 1 mK. By the end of this session, participants will be able to DESCRIBE and distinguish the major classes of contact thermometers, DESCRIBE how raw resistance data is transformed into a temperature calibration, and REALIZE an ice-point.

Decision Rules with Uncertainty Budgets and Lab and Field Standards: Mark Ruefenacht (NIST) and Lisa Corn (Texas)

It is important for metrology laboratories to understand their customers, organization, and Accreditation/Recognition requirements. In this session, common decision rules performed and evaluated in legal laboratory metrology will be explored. The criteria and conditions considered will be reviewed along with examples and scenarios. Participants will be able to UNDERSTAND the constraints that need to be considered with decision rules, IDENTIFY references for the constraints, and EXPLAIN the impact and significance of the decision rules on the field of legal laboratory metrology.

Volume Calibrations with LPG systems: Elizabeth Koncki (NIST) and Anna Pierce (Minnesota)

Volume Calibrations with Liquid Petroleum Gas (LPG) provers are common in legal metrology. This session will review the common components, applications, and processes for using an LPG prover in the field (documentary standard NIST Handbook 44) and for calibrating in a metrology laboratory (documentary standard NISTIR 7383, SOP 21), along with common challenges, safety considerations, and reference standards. Also, the status of the Field Reference Meter (FRM) project currently under evaluation as a substitute for LPG trailer-mounted prover systems will be presented. Participants will be able to IDENTIFY LPG prover common applications, EVALUATE LPG provers for conformance to specifications in NIST Handbook 105-4, and PERFORM a calibration checklist on an LPG prover.

THURSDAY

Realization of the Kilogram and the Consensus Value: Zeina Kubarych (NIST), Kevin Chesnutwood, and Mike Hicks (NIST)

NIST has been involved in the Redefinition of the Kilogram from a physical artifact to a fundamental constant of nature since the project initiation at the CIPM level. This session will provide background on the purpose and goal of this effort along with its current state. Participants will be able to DESCRIBE the role of NIST in the Redefinition of the Kilogram, QUANTIFY the impact of the Redefinition to the laboratory's traceability and uncertainty, and EXPLAIN the significance of this shift to their customers and friends.

Timers and Frequency Calibrations: Dustin Claycomb (Pennsylvania), Travis Garding (Alaska)

This session will review procedures SOP 22 (tuning forks, acoustic emitting devices) and SOP 24 (timers and stopwatches) for calibrations. The traceability hierarchy, NIST services for traceability, and types of equipment and instruments will be presented and discussed. The latest National PTs for tuning forks and stopwatches will also be reviewed during this session. Hands-on opportunities will be provided to practice performing a calibration of tuning forks or acoustic emitting devices and stopwatches. Uncertainty analyses and evaluation of group repeatability data will be considered. At the end of this session, participants will be able to: IDENTIFY various types of technologies used as reference standards; DESCRIBE the components of the Standard Operating Procedures, including each aspect of traceability, the step-by-step calibration processes, required calculations, measurement assurance methodologies,

and uncertainty analysis, and reporting; and PRACTICE performing hands-on calibrations using instruments and standards provided.

NCSLI Legal Metrology, Committee Meeting, Lisa Corn (Texas, NCSLI Legal Metrology Chair)
This session will include a presentation of the 2024 State Laboratory Workload Survey. Learning Objectives: Participants will be able to DESCRIBE the latest workload survey data and provide input into planning the next survey, EXTRACT relevant and critical data for application to their laboratory program for such things as facility evaluations, workload/staffing recommendations, fee structures, succession planning, and inclusion of data in annual Management Reviews.

State laboratory Program: Strategic Program Review and Input, OWM Staff
Come learn about future plans for the OWM Laboratory Metrology program. Participants will be able to IDENTIFY and DESCRIBE coming program and staffing changes.

Please complete the registration form legibly and submit to:

Mail:

Regional Measurement Assurance Association LLC
1144 Wallace Rd NW #255
Salem, OR 97304

Email: crmap_2025@outlook.com
(include CRMAP 2025 in the subject line)

ATTENDEE INFORMATION			
Name:	Organization:		
Address:			
City:	State:	Zip:	Country:
Phone:	Email:		

ATTENDEE'S GUEST INFORMATION
Name:

	REGISTRATION FEES	
☐	**Individual Registration (before 4/1/2025)**	**$450.00**
☐	**Individual Registration (on or after 4/1/2025)**	**$475.00**
☐	**Exhibitor Registration**	**$500.00**
☐	**Guest Registration (per guest)**	**$30.00**
Guest registration fees apply for guests participating in dinner / reception)		

PAYMENT INFORMATION	
Option	**Amount**
☐ Check Enclosed (made payable to: Regional Measurement Assurance Association LLC)	$
☐ Credit Card Authorization _____-_____-_____-_____. Exp _____/_____ _____ Signature	$
☐ Invoice me Payer information: Name: _____ Address: _____ _____ City: _____, State: _____. Zip Code: _____ Email: _____ Telephone: _____	$

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