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DEPARTMENT OF AGRICULTURE

*Nebraska Standards Laboratory*
3721 West Cuming St.
Lincoln, NE 68524
(402)-471-2087

**Director of Agriculture**
*Sherry Vinton*
P.O. Box 94947
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# *Calibration Certificate of Mass*

**Calibration Date:** May 17, 2023 | **Certificate Number:** 2023-069-1

**Submitted By:** FSCP Area 65
3721 West Cuming St.
Lincoln, NE 68524

**Point of Contact:** Brian Maser
Ph. 402-471-3422
**email:** *brian.maser@nebraska.gov*
**PO Number:** N/A

**Test Item(s):** Cast weights
**ID / Asset Number:** Area 65
**Manufacture:** Various
**Material:** Cast Iron

**Artifact(s) Description:**

**Date Received:** May 12, 2023
**Serial Number(s):** See Below
**Class Specification:** NIST Class F
**Condition:** Good (some wear)

| Reference Standards Used: | Procedure Used: | Equipment Used: |
|---|---|---|
| NSL lb standards | NIST HB 6969, SOP 8 (2019) | Mettler XPR32003 |

**Metrologist:** JPL

**Environmental Cond.** **Temp:** 22.2 °C **Pressure:** 727.9 mmHg **Relative Humidity:** 53.2 %

## Pertinent Information

- The artifact(s) listed in this document have been found and/or left within the maximum permissible error for the specification stated above, except as noted. An artifact is considered in-compliance when the correction plus the measurement uncertainty is equal to or less than the maximum permissible error. RED print indicates an out-of-compliance reading. It is the decision of the Laboratory to adjust the artifact(s) when the sum of the correction and the uncertainty exceed 95% of the maximum permissible error. All of the tolerances and design specifications (except density, hardness and magnetism) were evaluated according to ASTM E617 (2018) and/or NIST HB 105-1 (2019) for the artifacts designated class.

- All corrections stated in this report correlate to a “Conventional Mass” (CM), also known as "apparent mass”, scale verses 8.0 g/cm³ reference mass density and an air density of 1.2 mg/cm³ at 20 °C.

- It is the end user's responsibility to verify that the weights meet the accuracy requirements outlined in NIST Handbook 44 (2022), Appendix A Fundamental Considerations, when using the weights for calibration of commercial (Legal for Trade) scales.

## Traceability Statement

The artifact(s) described in this certificate have been compared to the Standards of the State of Nebraska. The Standards of the State of Nebraska are traceable to the International System of Units (SI) through the National Institute of Standards and Technology (NIST) and are part of a comprehensive measurement assurance program for ensuring continued accuracy and measurement traceability within the level of uncertainty reported by this laboratory. The calibration number for this certificate is the only unique calibration number to be used in referencing measurement traceability for the artifact(s) described in this certificate.

## Uncertainty Statement

The combined standard uncertainty includes uncertainties reported for the standard, uncertainties associated with the measurement process, uncertainties for any observed deviations from reference values which are less than surveillance limits and the standard uncertainty for any uncorrected errors associated with air buoyance corrections. The combined standard uncertainty is multiplied by a coverage factor ($k$), to give the expanded uncertainty, which defines an interval with a 95.45 percent level of confidence. The expanded uncertainty presented in this report is consistent with the *Guide to the Expression of Uncertainty in Measurement (2008, revised 2012)*. Some components of the calibration can be evaluated through a Type A evaluation, or the method of evaluation of uncertainty by the statistical analysis (standard deviation) from the observations taken. Magnetic testing has not been performed, therefore, there are no components for the effects of it in the uncertainty budget.

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**Calibration Date:** May 17, 2023

**Certificate Number:** 2023-069-1

## Calibration Results

| Nominal Mass | Serial Number / ID | As Found Conventional Mass Correction (g) | Adjusted (Y/N) | As Left Conventional Mass Correction (g) | Uncertainty ± (g) | (*k*) factor | NIST Class F MPE ± (g) | Assumed Density (g/cm³) |
|---|---|---|---|---|---|---|---|---|
| 15 lb | WM15-5 | -0.195 | N | -0.195 | 0.085 | 2.01 | 0.68 | 7.2 |
| 15 lb | WM15-6 | 0.095 | N | 0.095 | 0.085 | 2.01 | 0.68 | 7.2 |
| 25 lb | NE-61 | -0.40 | N | -0.40 | 0.14 | 2.01 | 1.1 | 7.2 |
| 25 lb | NE-62 | -0.28 | N | -0.28 | 0.14 | 2.01 | 1.1 | 7.2 |
| 25 lb | NE-63 | -0.07 | N | -0.07 | 0.14 | 2.01 | 1.1 | 7.2 |
| 25 lb | NE-64 | -0.29 | N | -0.29 | 0.14 | 2.01 | 1.1 | 7.2 |
| 25 lb | NE-65 | -0.44 | N | -0.44 | 0.14 | 2.01 | 1.1 | 7.2 |
| 25 lb | NE-66 | -0.61 | N | -0.61 | 0.14 | 2.01 | 1.1 | 7.2 |
| 25 lb | NE-67 | -0.25 | N | -0.25 | 0.14 | 2.01 | 1.1 | 7.2 |
| 25 lb | NE-68 | 0.00 | N | 0.00 | 0.14 | 2.01 | 1.1 | 7.2 |
| 25 lb | NE-69 | -0.36 | N | -0.36 | 0.14 | 2.01 | 1.1 | 7.2 |
| 25 lb | NE-70 | -0.23 | N | -0.23 | 0.14 | 2.01 | 1.1 | 7.2 |
| 25 lb | NE-71 | 0.35 | N | 0.35 | 0.14 | 2.01 | 1.1 | 7.2 |
| 25 lb | NE-72 | 0.26 | N | 0.26 | 0.14 | 2.01 | 1.1 | 7.2 |
| 25 lb | NE-73 | -0.18 | N | -0.18 | 0.14 | 2.01 | 1.1 | 7.2 |
| 25 lb | NE-74 | 0.24 | N | 0.24 | 0.14 | 2.01 | 1.1 | 7.2 |
| 25 lb | NE-75 | -0.20 | N | -0.20 | 0.14 | 2.01 | 1.1 | 7.2 |
| 25 lb | NE-76 | -0.16 | N | -0.16 | 0.14 | 2.01 | 1.1 | 7.2 |
| 25 lb | NE-77 | -0.29 | N | -0.29 | 0.14 | 2.01 | 1.1 | 7.2 |
| 25 lb | NE-78 | -0.11 | N | -0.11 | 0.14 | 2.01 | 1.1 | 7.2 |
| 25 lb | NE-79 | 0.26 | N | 0.26 | 0.14 | 2.01 | 1.1 | 7.2 |
| 25 lb | NE-80 | -0.23 | N | -0.23 | 0.14 | 2.01 | 1.1 | 7.2 |

**Conversion Factors**

1 ounce (avoirdupois) (oz) = 28.349 52 g
1 pound (avoirdupois) (lb) = 453.592 37 g exactly

*Joel P. Lavicky* *Metrologist*

5/24/2023
**Date of Issue**

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# Calibration Certificate of Mass

**Calibration Date:** May 18, 2023 | **Certificate Number:** 2023-069-2

**Submitted By:** FSCP Area 65
3721 West Cuming St.
Lincoln, NE 68524

**Point of Contact:** Brian Maser
Ph. 402-471-3422
**email:** *brian.maser@nebraska.gov*
**PO Number:** N/A

**Test Item(s):** lb weight kit
**Serial Number(s):** NSL-1A96 / 17647
**Condition:** Good (some wear)
**Material:** Stainless Steel & Aluminum

**Artifact(s) Description:**

**Date Received:** May 12, 2023
**ID / Asset Number:** Area 65
**Class Specification:** NIST Class F
**Manufacture:** Troemner

**Reference Standards Used:**
NSL lb standards

**Procedure Used:**
NIST HB 6969, SOP 8 (2019)

**Metrologist:**
JPL

**Equipment Used:**
Sartorius CC 1201
Sartorius CCE6
Mettler XPR 205

**Environmental Cond.** **Temp:** 21.38 °C **Pressure:** 728.28 mmHg **Relative Humidity:** 49.64 %

## Pertinent Information

- The artifact(s) listed in this document have been found and/or left within the maximum permissible error for the specification stated above, except as noted. An artifact is considered in-compliance when the correction plus the measurement uncertainty is equal to or less than the maximum permissible error. RED print indicates an out-of-compliance reading. It is the decision of the Laboratory to adjust the artifact(s) when the sum of the correction and the uncertainty exceed 95% of the maximum permissible error. All of the tolerances and design specifications (except density, hardness and magnetism) were evaluated according to ASTM E617 (2018) and/or NIST HB 105-1 (2019) for the artifacts designated class.

- All corrections stated in this report correlate to a “Conventional Mass” (CM), also known as "apparent mass”, scale verses 8.0 g/cm³ reference mass density and an air density of 1.2 mg/cm³ at 20 °C.

- It is the end user's responsibility to verify that the weights meet the accuracy requirements outlined in NIST Handbook 44 (2020), Appendix A Fundamental Considerations, when using the weights for calibration of commercial (Legal for Trade) scales.

## Traceability Statement

The artifact(s) described in this certificate have been compared to the Standards of the State of Nebraska. The Standards of the State of Nebraska are traceable to the International System of Units (SI) through the National Institute of Standards and Technology (NIST) and are part of a comprehensive measurement assurance program for ensuring continued accuracy and measurement traceability within the level of uncertainty reported by this laboratory. The calibration number for this certificate is the only unique calibration number to be used in referencing measurement traceability for the artifact(s) described in this certificate.

## Uncertainty Statement

The combined standard uncertainty includes uncertainties reported for the standard, uncertainties associated with the measurement process, uncertainties for any observed deviations from reference values which are less than surveillance limits and the standard uncertainty for any uncorrected errors associated with air buoyance corrections. The combined standard uncertainty is multiplied by a coverage factor ($k$), to give the expanded uncertainty, which defines an interval with a 95.45 percent level of confidence. The expanded uncertainty presented in this report is consistent with the *Guide to the Expression of Uncertainty in Measurement (2008, revised 2012)*. Some components of the calibration can be evaluated through a Type A evaluation, or the method of evaluation of uncertainty by the statistical analysis (standard deviation) from the observations taken. Magnetic testing has not been performed, therefore, there are no components for the effects of it in the uncertainty budget.

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**Calibration Date:** May 18, 2023

**Certificate Number:** 2023-069-2

## Calibration Results

| Nominal Mass | Serial Number / ID | As Found Conventional Mass Correction (g) | Adjusted (Y/N) | As Left Conventional Mass Correction (g) | Uncertainty ± (g) | (*k*) factor | NIST Class F MPE ± (g) | Assumed Density (g/cm³) |
|---|---|---|---|---|---|---|---|---|
| 2 lb | 1 | 0.044 | n | 0.044 | 0.011 | 2 | 0.091 | 7.84 |
| 2 lb | 2 | 0.041 | n | 0.041 | 0.011 | 2 | 0.091 | 7.84 |
| 2 lb | 3 | 0.032 | n | 0.032 | 0.011 | 2 | 0.091 | 7.84 |
| 2 lb | 4 | 0.045 | n | 0.045 | 0.011 | 2 | 0.091 | 7.84 |
| 2 lb | 5 | 0.042 | n | 0.042 | 0.011 | 2 | 0.091 | 7.84 |
| 2 lb | 6 | 0.029 | n | 0.029 | 0.011 | 2 | 0.091 | 7.84 |
| 2 lb | 7 | 0.012 | n | 0.012 | 0.011 | 2 | 0.091 | 7.84 |
| 2 lb | 8 | 0.010 | n | 0.010 | 0.011 | 2 | 0.091 | 7.84 |
| 2 lb | 9 | 0.045 | n | 0.045 | 0.011 | 2 | 0.091 | 7.84 |
| 2 lb | 10 | 0.024 | n | 0.024 | 0.011 | 2 | 0.091 | 7.84 |
| 2 lb | 11 | 0.027 | n | 0.027 | 0.011 | 2 | 0.091 | 7.84 |
| 2 lb | 12 | 0.041 | n | 0.041 | 0.011 | 2 | 0.091 | 7.84 |
| 2 lb | 13 | 0.014 | n | 0.014 | 0.011 | 2 | 0.091 | 7.84 |
| 2 lb | 14 | 0.015 | n | 0.015 | 0.011 | 2 | 0.091 | 7.84 |
| 1 lb | 15 | 0.0245 | n | 0.0245 | 0.0083 | 2 | 0.07 | 7.84 |
| 1 lb | 16 | 0.0038 | n | 0.0038 | 0.0083 | 2 | 0.07 | 7.84 |
| 0.2 lb | | 0.0082 | n | 0.0082 | 0.0022 | 2 | 0.018 | 7.84 |
| 0.2 lb | * | 0.0093 | n | 0.0093 | 0.0022 | 2 | 0.018 | 7.84 |
| 0.1 lb | | 0.0043 | n | 0.0043 | 0.0011 | 2 | 0.0091 | 7.84 |
| 0.05 lb | | 0.00292 | n | 0.00292 | 0.00054 | 2 | 0.0045 | 7.84 |
| 0.02 lb | | 0.00080 | n | 0.00080 | 0.00022 | 2 | 0.0018 | 7.84 |
| 0.02 lb | * | 0.00075 | n | 0.00075 | 0.00022 | 2 | 0.0018 | 7.84 |
| 0.01 lb | | 0.00078 | n | 0.00078 | 0.00018 | 2 | 0.0015 | 7.84 |
| 0.005 lb | | 0.00066 | n | 0.00066 | 0.00014 | 2 | 0.0012 | 2.7 |
| 0.002 lb | | 0.00008 | n | 0.00008 | 0.00011 | 2 | 0.00087 | 2.7 |
| 0.002 lb | * | -0.00019 | n | -0.00019 | 0.00011 | 2 | 0.00087 | 2.7 |
| 0.001 lb | | 0.000136 | n | 0.000136 | 0.000083 | 2 | 0.0007 | 2.7 |
| 8 oz | | 0.0041 | n | 0.0041 | 0.0054 | 2 | 0.045 | 7.84 |
| 4 oz | | 0.0021 | n | 0.0021 | 0.0028 | 2 | 0.023 | 7.84 |
| 2 oz | | 0.0015 | n | 0.0015 | 0.0013 | 2 | 0.011 | 7.84 |
| 1 oz | | 0.00105 | n | 0.00105 | 0.00064 | 2 | 0.0054 | 7.84 |
| 1/2 oz | | 0.00125 | n | 0.00125 | 0.00034 | 2 | 0.0028 | 7.84 |
| 1/4 oz | | 0.00099 | n | 0.00099 | 0.00021 | 2 | 0.0017 | 7.84 |
| 1/8 oz | | 0.00055 | n | 0.00055 | 0.00016 | 2 | 0.0013 | 7.84 |

**Conversion Factors**

1 ounce (avoirdupois) (oz) = 28.349 52 g
1 pound (avoirdupois) (lb) = 453.592 37 g exactly

*Joel P. Lavicky* *Metrologist*

5/24/2023
**Date of Issue**

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# *Calibration Certificate of Mass*

**Calibration Date:** May 18, 2023 | **Certificate Number:** 2023-069-3

**Submitted By:** FSCP Area 65
3721 West Cuming St.
Lincoln, NE 68524

**Point of Contact:** Brian Maser
Ph. 402-471-3422
**email:** *brian.maser@nebraska.gov*
**PO Number:** N/A

**Test Item(s):** Metric Weight Kit
**Serial Number(s):** **WM-G89-9**
**Condition:** Excellent (little wear)
**Material:** Stainless Steel

**Artifact(s) Description:**

**Date Received:** 5/12/2023
**ID / Asset Number:** **Area 65**
**Class Specification:** ASTM 4
**Manufacture:** Troemner

| Reference Standards Used: | Procedure Used: | Equipment Used: |
|---|---|---|
| NSL & /Den Metric<br>Voland-1707 | NIST HB 6969, SOP 8 (2019)<br>**Metrologist:**<br>JPL | Sartorius CC 1201<br>Mettler XPR 205<br>Sartorius CCE6 |

**Environmental Cond.** **Temp:** 21.24 °C **Pressure:** 728.1 mmHg **Relative Humidity:** 49.9 %

## Pertinent Information

● The artifact(s) listed in this document have been found and/or left within the maximum permissible error for the specification stated above, except as noted. An artifact is considered in-compliance when the correction plus the measurement uncertainty is equal to or less than the maximum permissible error. RED print indicates an out-of-compliance reading. It is the decision of the Laboratory to adjust the artifact(s) when the sum of the correction and the uncertainty exceed 95% of the maximum permissible error. All of the tolerances and design specifications (except density, hardness and magnetism) were evaluated according to ASTM E617 (2018) and/or NIST HB 105-1 (2019) for the artifacts designated class.

● All corrections stated in this report correlate to a “Conventional Mass” (CM), also known as "apparent mass”, scale verses 8.0 g/cm³ reference mass density and an air density of 1.2 mg/cm³ at 20 °C.

● **The Artifacts in "red" do not meet ASTM 4 tolerances but do meet ASTM 5 tolerances and should be evaluated before use.**

● It is the end user's responsibility to verify that the weights meet the accuracy requirements outlined in NIST Handbook 44 (2020), Appendix A Fundamental Considerations, when using the weights for calibration of commercial (Legal for Trade) scales.

## Traceability Statement

The artifact(s) described in this certificate have been compared to the Standards of the State of Nebraska. The Standards of the State of Nebraska are traceable to the International System of Units (SI) through the National Institute of Standards and Technology (NIST) and are part of a comprehensive measurement assurance program for ensuring continued accuracy and measurement traceability within the level of uncertainty reported by this laboratory. The calibration number for this certificate is the only unique calibration number to be used in referencing measurement traceability for the artifact(s) described in this certificate.

## Uncertainty Statement

The combined standard uncertainty includes uncertainties reported for the standard, uncertainties associated with the measurement process, uncertainties for any observed deviations from reference values which are less than surveillance limits and the standard uncertainty for any uncorrected errors associated with air buoyance corrections. The combined standard uncertainty is multiplied by a coverage factor ($k$), to give the expanded uncertainty, which defines an interval with a 95.45 percent level of confidence. The expanded uncertainty presented in this report is consistent with the *Guide to the Expression of Uncertainty in Measurement (2008, revised 2012)*. Some components of the calibration can be evaluated through a Type A evaluation, or the method of evaluation of uncertainty by the statistical analysis (standard deviation) from the observations taken. Magnetic testing has not been performed, therefore, there are no components for the effects of it in the uncertainty budget.

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**Calibration Date:** May 18, 2023

**Certificate Number:** 2023-069-3

## Calibration Results

| Nominal Mass | Serial Number / ID | As Found Conventional Mass Correction (g) | Adjusted (Y/N) | As Left Conventional Mass Correction (g) | Uncertainty ± (g) | (*k*) factor | ASTM 4 MPE ± (g) | Assumed Density (g/cm³) |
|---|---|---|---|---|---|---|---|---|
| 300 g | | 0.00542 | n | 0.00542 | 0.00089 | 2 | 0.006 | 7.95 |
| 200 g | | 0.00089 | n | 0.00089 | 0.00064 | 2.004 | 0.004 | 7.84 |
| 100 g | | 0.00028 | n | 0.00028 | 0.00025 | 2.001 | 0.002 | 7.84 |
| 50 g | | -0.00008 | n | -0.00008 | 0.00015 | 2.003 | 0.0012 | 7.84 |
| 30 g | | -0.00008 | n | -0.00008 | 0.00012 | 2.003 | 0.0009 | 7.84 |
| 20 g | | 0.000611 | n | 0.000611 | 0.000091 | 2.003 | 0.0007 | 7.84 |
| 10 g | | 0.000312 | n | 0.000312 | 0.000064 | 2.009 | 0.0005 | 7.84 |
| 5 g | | 0.000146 | n | 0.000146 | 0.000045 | 2.001 | 0.00036 | 7.84 |
| 3 g | | 0.000162 | n | 0.000162 | 0.000038 | 2.001 | 0.0003 | 7.84 |
| 2 g | | 0.000043 | n | 0.000043 | 0.000033 | 2.002 | 0.00026 | 7.84 |
| 1 g | | 0.000016 | n | 0.000016 | 0.000025 | 2.004 | 0.0002 | 7.84 |

**Conversion Factors**

1 ounce (avoirdupois) (oz) = 28.349 52 g
1 pound (avoirdupois) (lb) = 453.592 37 g exactly

*Joel P. Lavicky* *Metrologist*

5/24/2023
**Date of Issue**

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**Calibration Date:** 5/16/2023

# *Certificate of Calibration of Volume Transfer*

**Certificate Number:** 2023-069-5

**Items Submitted:**

| Quantity | Nominal Volume | Manufacturer | Type |
|---|---|---|---|
| 3 | 5 gal | SMI | "Special" J Prover |

**Submitted By:** FSCP Area 65
3721 West Cuming St.
Lincoln, NE 68524

**POC:** Brian Maser
402-471-3422
brian.maser@nebraska.gov

**Test Results**

| Nominal Volume | Serial Number | Material | Cubical Coefficient of Expansion (/°F) | **As Found Volume Delivered @ 60 °F** | **As left Volume Delivered @ 60 °F** | Uncertainty (U) | (*k*) |
|---|---|---|---|---|---|---|---|
| 5 gal | 9038 034 | SS | 0.0000265 | **4.9999 gal** | **4.9999 gal** | 0.0010 gal | 2.01 |
| 5 gal | 9038 035 | SS | 0.0000265 | **4.9974 gal** | **4.9974 gal** | 0.0010 gal | 2.01 |
| 5 gal | 9038 036 | SS | 0.0000265 | **5.0009 gal** | **5.0009 gal** | 0.0010 gal | 2.01 |

*The data in this report only applies to those items specifically listed on this report.*

Volume delivered at 60˚F after a 30 second pour and 10 second drain for test measures. For provers a 30 second drain time would apply.

**Conversion Factors:**

1 gal = 231 in³
1 gal = 3.785 412 E-03 m³

**Traceability Statement:**

The artifact(s) described in this report have been compared to the Standards of the State of Nebraska. The Standards of the State of Nebraska are traceable to the International System of Units (SI) through the National Institute of Standards and Technology (NIST) and are part of a comprehensive measurement assurance program for ensuring continued accuracy and measurement traceability within the level of uncertainty reported by this laboratory. The calibration number for this report is the only unique calibration number to be used in referencing measurement traceability for the artifact(s) described in this report.

**Uncertainty Statement:**

The combined standard uncertainty includes uncertainties reported for the standard, uncertainties associated with the measurement process, uncertainties for any observed deviations from reference values which are less than surveillance limits and the standard uncertainty for any uncorrected errors. The combined standard uncertainty is multiplied by a coverage factor (*k*), to give the expanded uncertainty, which defines an interval with a 95.45 percent level of confidence. The expanded uncertainty presented in this report is consistent with the Guide to the Expression of Uncertainty in Measurement (2008, revised 2012). Some components of the calibration can be evaluated through a Type A evaluation, or the method of evaluation of uncertainty by the statistical analysis (standard deviation) from the observations taken.

**Pertinent Information:**

The artifact(s) listed above have been found and/or left within the maximum permissible error for the specification stated above, except as noted. An artifact is considered in-compliance when the correction plus the measurement uncertainty is equal to or less than the maximum permissible error. It is the decision of the Laboratory to adjust the artifact(s) when the sum of the correction and uncertainty exceed 95% of the maximum permissible error. All of the tolerances and specifications were evaluated according to NIST HB 105-3 (2010).

**Condition of Item(s) Submitted for Calibration:**
Good

**Laboratory Reference Standard Used;**
5 gal SP NE 1586

**Treatment of Item(s) before Calibration:**
Tested as Found

**Procedure Used:**
NISTIR 7383, SOP 19 (2019)

**Environmental conditions at time of calibration:**

| | | | |
|---|---|---|---|
| Temp ˚C | 21.7 | Humidity % | 44.4 |
| Pressure mmHg | 734.60 | | |

**Water temperature at time of calibration:**
69.93 ◦F

**Date Submitted:** 5/12/2023

**Joel P. Lavicky, Metrologist**

**5/24/2023**
Issue Date: