

# State of Wisconsin



## HMA & SMA Test Strip Spreadsheet Instruction Manual

2026 Edition

## **1. Disclaimer**

This document is to be used as an instructive guide for the HMA and SMA Test Strip Spreadsheet and to answer frequently asked questions of Regional Technical Services Section (TSS) and those acting as Department Representatives. It is not a substitute for reading and understanding the specifications.

If there is a question about referee testing or data entry that is not covered in this document, please contact the Regional PWL Representative. If consulting BTS is recommended by this document or the Test Strip Spreadsheet, that contact should be made by TSS Staff.

The HMA & SMA Test Strip Spreadsheet is designed to simplify the recording and analysis of contractor Quality Control (QC) and department Quality Verification (QV) data related to pavement density and air voids used for test strip pay adjustment.

The Plans, Standard Specifications, and Special Provisions ALWAYS supersede this document, even in cases where this document may contradict those provisions.

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### 3. General

- A copy of this instruction manual is available within the HMA & SMA Test Strip Spreadsheet on the *Project Info & Instructions* worksheet. Simply double click the button “Test Strip Manual” to access them from within the spreadsheet.
- The Test Strip Spreadsheet should be filled out and completed by the Department Representative.
- The *Project Info & Instructions* worksheet must be filled out first prior to entering test results. Worksheets will not appear until the required project information has been entered.
- Worksheets tab colors indicate the following:
  - Green – Worksheets that require test results to be entered.
  - Red – Worksheets that only present results; no data entry is required in these sheets.
  - Purple – Worksheets that are only available to TSS Staff in TSS Mode.
- Cells that are canary/yellow colored are data entry fields.
  - It is essential that no blank spaces are entered in or after any of the information entered into the fields.
  - When copy/pasting, only use “Paste Values”. If you use the hotkey combination, CTRL+V, values will be pasted automatically.

#### 4. Project Info & Instructions

This is the main entry point for the PWL Test Strip Spreadsheet (Figure 1). It contains fields for information about the project as well as paving information such as the mix design and pavement layer and dimensions.

The canary/yellow fields on the *Project Info and Instructions* worksheet should be filled out completely by the Department Representative prior to beginning construction. Most of the fields in the *Project Info & Instructions* worksheet (i.e.: Contract Unit Price, Lane Width, Nominal Thickness, JMFs, etc.) are required for the worksheet to function correctly. The Test Strip Acceptance Type (Volumetrics and Density, Density-Only, and Volumetric-Only) must be selected to hide or reveal the correct worksheets and fields for data entry (Figure 2). Project information used in all other worksheets within the spreadsheet are referenced from the *Project Info & Instructions* worksheet and can only be changed from this worksheet.

The screenshot shows the 'Project Info & Instructions' worksheet of the 'Wisconsin Department of Transportation HMA & SMA Test Strip Spreadsheet (Version: 3.0)'. The interface is organized into several sections:

- Project Information:** Contains fields for Contract ID, Project ID, County, Route/Road, Contractor, Project Leader, Date Constructed, Test Strip Number, Pavement Layer, Underlying Layer, Paving Width (ft), Lane Width (ft), Nominal Thickness (in), Start Station, End Station, Stations Increasing / Decreasing?, Length / Tonnage Known?, Estimated Length / Tonnage, and Calculated Length / Tonnage.
- Mixture Information:** Contains fields for WisDOT Mix Design ID, Mix Type, Mix Gradation, Mix PG, Binder Designation, Mix Classification, JMF % AC, JMF AC Specific Gravity, JMF Gmm, JMF Gse, JMF Gsb, and Contract Unit Price.
- Test Strip Acceptance:** Contains a field for Type.
- Instructions:** Includes a link to the 'Test Strip Manual\_2026 Edition.pdf'.
- Controls:** Includes a button to 'Save with Automatic File Name and Email to BTS (Outlook Required)'.

Figure 1: Project Info & Instructions Interface.

Notes:

- For **HMA**, two additional fields will appear for a Density-Only Test Strip:
  - Daily Average Gmm
  - Production Gmm or Non-Random Dept. Gmm
- For **SMA**, one additional field will appear for a Density-Only Test Strip:
  - Daily Average Gmm

At the end of the Test Strip, the Department Representative must enter the Test Strip's Final Tonnage (cell D43) and Final Length (ft., cell D55). These fields are blue to indicate that they are entered at the completion of the test strip. These final values are used for the pay adjustments.

Figure 2: Expanded Project Info & Instructions Interface.

There are several buttons for worksheet functions found on the righthand side of the interface. The buttons perform the following functions:

|                                                                                     |                                                                                                                                                                                                                                                                                                                                                                  |
|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <ul style="list-style-type: none"> <li>• Saves the file using the automatic file name.</li> <li>• After the file is saved, an email will be generated with the Excel file attached for submittal to BTS with pre-filled email fields. You may edit the email before sending.</li> </ul>                                                                          |
|  | <ul style="list-style-type: none"> <li>• This button is only visible for Volumetrics and Density, and Density-Only Test Strips.</li> <li>• This will generate the random density zones and sampling locations which will be displayed to the left of the button in fields D49 and D50. These locations are also used on the field density worksheets.</li> </ul> |

|                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                |
|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <ul style="list-style-type: none"><li>• This button is only visible for Volumetrics and Density, and Density-Only Test Strips.</li><li>• Random Density Zones must be generated before using this feature.</li><li>• Exports only the field density worksheets (QC-1, QC-2, QV-1, and QV-2 Density Worksheets) as a PDF. These can be printed and used in the field.</li></ul> |
|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## 5. Split Sample Comparison

This worksheet only appears when either “Combined Density and Volumetrics” or “Volumetric-Only” is selected as the Test Strip Type on the *Project Info & Instruction* worksheet. The correct version of this worksheet will appear for either HMA or SMA based on the Mix Type entered on the *Project Info & Instruction* worksheet. This worksheet is used to enter the split samples’ Gmm and Gmb results as well as the results of any dispute testing, if required. The split sample comparison is a check for reasonable test result differences between labs.

The Department Representative will enter the following information from the split sample comparison testing (Figure 3 or ):

- QC Gmms
- QV Gmms
- QC Gmbs
- QV Gmbs
- BTS Referee Gmms (if required)
- BTS Referee Gmbs (if required)

|  <b>HMA Split Sample Comparison Testing</b><br>Wisconsin Department of Transportation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |            |                       |                       |                                                                                                                                                                                                                                                                |                       |                     |                 |                              |                      |                              |                      |  |  |  |                     |         |                       |                       |                              |                      |                     |                 |                    |  |                    |  |                              |                      |                              |                      |   |  |  |  |  |                 |         |       |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |                       |  |  |  |  |  |  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|-----------------------|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|---------------------|-----------------|------------------------------|----------------------|------------------------------|----------------------|--|--|--|---------------------|---------|-----------------------|-----------------------|------------------------------|----------------------|---------------------|-----------------|--------------------|--|--------------------|--|------------------------------|----------------------|------------------------------|----------------------|---|--|--|--|--|-----------------|---------|-------|--|--|--|--|---|--|--|--|--|--|--|--|--|--|--|--|---|--|--|--|--|-----------------------|--|--|--|--|--|--|
| Date:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            | Test Strip #:         |                       | If datasets compare and testing differences are within testing tolerance, QC data is carried into the Air Voids Pay Factor worksheet. <b>If not, BTS will conduct referee testing and BTS data will be entered below and used for subsequent calculations.</b> |                       |                     |                 |                              |                      |                              |                      |  |  |  |                     |         |                       |                       |                              |                      |                     |                 |                    |  |                    |  |                              |                      |                              |                      |   |  |  |  |  |                 |         |       |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |                       |  |  |  |  |  |  |
| Project ID:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |            | Route/Road:           |                       |                                                                                                                                                                                                                                                                |                       |                     |                 |                              |                      |                              |                      |  |  |  |                     |         |                       |                       |                              |                      |                     |                 |                    |  |                    |  |                              |                      |                              |                      |   |  |  |  |  |                 |         |       |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |                       |  |  |  |  |  |  |
| Mix Type:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |            | Layer:                |                       |                                                                                                                                                                                                                                                                |                       |                     |                 |                              |                      |                              |                      |  |  |  |                     |         |                       |                       |                              |                      |                     |                 |                    |  |                    |  |                              |                      |                              |                      |   |  |  |  |  |                 |         |       |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |                       |  |  |  |  |  |  |
| JMF Gmm: Enter JMF Gmm.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |            |                       |                       |                                                                                                                                                                                                                                                                |                       |                     |                 |                              |                      |                              |                      |  |  |  |                     |         |                       |                       |                              |                      |                     |                 |                    |  |                    |  |                              |                      |                              |                      |   |  |  |  |  |                 |         |       |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |                       |  |  |  |  |  |  |
| <b>G<sub>mm</sub></b> <table border="1" style="width: 100%;"> <thead> <tr> <th rowspan="2">Split Sample Number</th> <th rowspan="2">Tonnage</th> <th rowspan="2">QC Gmm</th> <th rowspan="2">QV Gmm</th> <th rowspan="2">Difference (X<sub>d</sub>)</th> <th rowspan="2">X<sub>d</sub> Mean:</th> <th rowspan="2">Degrees of Freedom:</th> <th rowspan="2">BTS Referee Gmm</th> <th colspan="2">BTS Vs. QC Results</th> <th colspan="2">BTS Vs. QV Results</th> </tr> <tr> <th>Difference (X<sub>d</sub>)</th> <th>X<sub>d</sub> Mean:</th> <th>Difference (X<sub>d</sub>)</th> <th>X<sub>d</sub> Mean:</th> </tr> </thead> <tbody> <tr> <td>1</td> <td></td> <td></td> <td></td> <td></td> <td>t-test p-value:</td> <td>Prob. α</td> <td>0.010</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>2</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>3</td> <td></td> <td></td> <td></td> <td></td> <td>Split Sample Results:</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> |            |                       |                       |                                                                                                                                                                                                                                                                |                       |                     |                 |                              |                      |                              |                      |  |  |  | Split Sample Number | Tonnage | QC Gmm                | QV Gmm                | Difference (X <sub>d</sub> ) | X <sub>d</sub> Mean: | Degrees of Freedom: | BTS Referee Gmm | BTS Vs. QC Results |  | BTS Vs. QV Results |  | Difference (X <sub>d</sub> ) | X <sub>d</sub> Mean: | Difference (X <sub>d</sub> ) | X <sub>d</sub> Mean: | 1 |  |  |  |  | t-test p-value: | Prob. α | 0.010 |  |  |  |  | 2 |  |  |  |  |  |  |  |  |  |  |  | 3 |  |  |  |  | Split Sample Results: |  |  |  |  |  |  |
| Split Sample Number                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Tonnage    | QC Gmm                | QV Gmm                | Difference (X <sub>d</sub> )                                                                                                                                                                                                                                   | X <sub>d</sub> Mean:  | Degrees of Freedom: | BTS Referee Gmm | BTS Vs. QC Results           |                      | BTS Vs. QV Results           |                      |  |  |  |                     |         |                       |                       |                              |                      |                     |                 |                    |  |                    |  |                              |                      |                              |                      |   |  |  |  |  |                 |         |       |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |                       |  |  |  |  |  |  |
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| 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |            |                       |                       |                                                                                                                                                                                                                                                                |                       |                     |                 |                              |                      |                              |                      |  |  |  |                     |         |                       |                       |                              |                      |                     |                 |                    |  |                    |  |                              |                      |                              |                      |   |  |  |  |  |                 |         |       |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |                       |  |  |  |  |  |  |
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| Split Sample Number                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Tonnage    | QC Gmb                | QV Gmb                | Difference (X <sub>d</sub> )                                                                                                                                                                                                                                   | X <sub>d</sub> Mean:  | Degrees of Freedom: | BTS Referee Gmb | BTS Vs. QC Results           |                      | BTS Vs. QV Results           |                      |  |  |  |                     |         |                       |                       |                              |                      |                     |                 |                    |  |                    |  |                              |                      |                              |                      |   |  |  |  |  |                 |         |       |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |                       |  |  |  |  |  |  |
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| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |            |                       |                       |                                                                                                                                                                                                                                                                | t-test p-value:       | Prob. α             | 0.010           |                              |                      |                              |                      |  |  |  |                     |         |                       |                       |                              |                      |                     |                 |                    |  |                    |  |                              |                      |                              |                      |   |  |  |  |  |                 |         |       |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |                       |  |  |  |  |  |  |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |            |                       |                       |                                                                                                                                                                                                                                                                |                       |                     |                 |                              |                      |                              |                      |  |  |  |                     |         |                       |                       |                              |                      |                     |                 |                    |  |                    |  |                              |                      |                              |                      |   |  |  |  |  |                 |         |       |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |                       |  |  |  |  |  |  |
| 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |            |                       |                       |                                                                                                                                                                                                                                                                | Split Sample Results: |                     |                 |                              |                      |                              |                      |  |  |  |                     |         |                       |                       |                              |                      |                     |                 |                    |  |                    |  |                              |                      |                              |                      |   |  |  |  |  |                 |         |       |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |                       |  |  |  |  |  |  |
| <b>Note:</b><br>This review is a check for reasonable test result differences between labs. Due to the small sample size, <20, it is possible to have two sets of data that fail the t-test (p-value), but the "X <sub>d</sub> Means are within tolerance". For such differences, if allowed by the engineer, asphalt mix production may resume as the test result differences are based on small sample sizes and consistent testing differences. In such cases, if all Gmm are within tolerance to the JMF and both X <sub>d</sub> Means are within tolerance, QC Gmm and Gmb data will be used for analysis if the name of the Regional PWL Rep is entered in the box that reveals itself above.                                                                                                                                                                                                                                                                                                                                                                                                               |            |                       |                       |                                                                                                                                                                                                                                                                |                       |                     |                 |                              |                      |                              |                      |  |  |  |                     |         |                       |                       |                              |                      |                     |                 |                    |  |                    |  |                              |                      |                              |                      |   |  |  |  |  |                 |         |       |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |                       |  |  |  |  |  |  |
| It is also possible to have two-sets of test results that are so variable that the results pass the t-test (p-value), but the "X <sub>d</sub> Mean exceeds tolerance". The cause of this type testing variation needs to be resolved before production of mix resumes.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |            |                       |                       |                                                                                                                                                                                                                                                                |                       |                     |                 |                              |                      |                              |                      |  |  |  |                     |         |                       |                       |                              |                      |                     |                 |                    |  |                    |  |                              |                      |                              |                      |   |  |  |  |  |                 |         |       |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |                       |  |  |  |  |  |  |
| <table border="1" style="width: 100%;"> <thead> <tr> <th colspan="3">Air Voids %</th> </tr> <tr> <th>Contractor</th> <th>Department</th> <th>BTS</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> </tr> </tbody> </table>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |            |                       |                       |                                                                                                                                                                                                                                                                |                       |                     |                 |                              |                      |                              |                      |  |  |  | Air Voids %         |         |                       | Contractor            | Department                   | BTS                  |                     |                 |                    |  |                    |  |                              |                      |                              |                      |   |  |  |  |  |                 |         |       |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |                       |  |  |  |  |  |  |
| Air Voids %                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |            |                       |                       |                                                                                                                                                                                                                                                                |                       |                     |                 |                              |                      |                              |                      |  |  |  |                     |         |                       |                       |                              |                      |                     |                 |                    |  |                    |  |                              |                      |                              |                      |   |  |  |  |  |                 |         |       |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |                       |  |  |  |  |  |  |
| Contractor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Department | BTS                   |                       |                                                                                                                                                                                                                                                                |                       |                     |                 |                              |                      |                              |                      |  |  |  |                     |         |                       |                       |                              |                      |                     |                 |                    |  |                    |  |                              |                      |                              |                      |   |  |  |  |  |                 |         |       |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |                       |  |  |  |  |  |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |            |                       |                       |                                                                                                                                                                                                                                                                |                       |                     |                 |                              |                      |                              |                      |  |  |  |                     |         |                       |                       |                              |                      |                     |                 |                    |  |                    |  |                              |                      |                              |                      |   |  |  |  |  |                 |         |       |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |                       |  |  |  |  |  |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |            |                       |                       |                                                                                                                                                                                                                                                                |                       |                     |                 |                              |                      |                              |                      |  |  |  |                     |         |                       |                       |                              |                      |                     |                 |                    |  |                    |  |                              |                      |                              |                      |   |  |  |  |  |                 |         |       |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |                       |  |  |  |  |  |  |

Gmm  
X<sub>d</sub> Mean  
Tolerance  
0.012

Gmb  
X<sub>d</sub> Mean  
Tolerance  
0.012

Figure 3: HMA Split Sample Comparison data entry fields.



|    | A                                                                                                                                                                                                                                       | B       | C      | D                   | E                            | F               | G                            | H                            | I          | J | K                                                                                                                                                                      | L |
|----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|--------|---------------------|------------------------------|-----------------|------------------------------|------------------------------|------------|---|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| 1  | <b>SMA Split Sample Comparison Testing</b><br><b>Wisconsin Department of Transportation</b>                                                                                                                                             |         |        |                     |                              |                 |                              |                              |            |   |                                                                                                                                                                        |   |
| 2  |                                                                                                                                                                                                                                         |         |        |                     |                              |                 |                              |                              |            |   |                                                                                                                                                                        |   |
| 3  |                                                                                                                                                                                                                                         |         |        |                     |                              |                 |                              |                              |            |   |                                                                                                                                                                        |   |
| 4  |                                                                                                                                                                                                                                         |         |        |                     |                              |                 |                              |                              |            |   |                                                                                                                                                                        |   |
| 5  |                                                                                                                                                                                                                                         |         |        |                     |                              |                 |                              |                              |            |   |                                                                                                                                                                        |   |
| 6  | Date: _____                                                                                                                                                                                                                             |         |        | Test Strip #: _____ |                              |                 |                              |                              |            |   |                                                                                                                                                                        |   |
| 7  | Project ID: _____                                                                                                                                                                                                                       |         |        | Route/Road: _____   |                              |                 |                              |                              |            |   |                                                                                                                                                                        |   |
| 8  | Mix Type: -SMA-                                                                                                                                                                                                                         |         |        | Layer: _____        |                              |                 |                              |                              |            |   |                                                                                                                                                                        |   |
| 9  | JMF Gmm: Enter JMF Gmm.                                                                                                                                                                                                                 |         |        |                     |                              |                 |                              |                              |            |   |                                                                                                                                                                        |   |
| 10 | <b>G<sub>mm</sub></b>                                                                                                                                                                                                                   |         |        |                     |                              |                 | BTS Vs. QC                   |                              | BTS Vs. QV |   | <div style="border: 1px solid black; padding: 5px; width: 100px; margin: 0 auto;"> <b>Gmm<br/>X<sub>d</sub><br/>Tolerance</b><br/><br/>           0.015         </div> |   |
| 11 | Split Sample Number                                                                                                                                                                                                                     | Tonnage | QC Gmm | QV Gmm              | Difference (X <sub>d</sub> ) | BTS Referee Gmm | Difference (X <sub>d</sub> ) | Difference (X <sub>d</sub> ) |            |   |                                                                                                                                                                        |   |
| 12 | 1                                                                                                                                                                                                                                       |         |        |                     |                              |                 |                              |                              |            |   |                                                                                                                                                                        |   |
| 13 | 2                                                                                                                                                                                                                                       |         |        |                     |                              |                 |                              |                              |            |   |                                                                                                                                                                        |   |
| 14 |                                                                                                                                                                                                                                         |         |        |                     |                              |                 |                              |                              |            |   |                                                                                                                                                                        |   |
| 15 |                                                                                                                                                                                                                                         |         |        |                     |                              |                 |                              |                              |            |   |                                                                                                                                                                        |   |
| 16 |                                                                                                                                                                                                                                         |         |        |                     |                              |                 |                              |                              |            |   |                                                                                                                                                                        |   |
| 17 | <b>G<sub>mb</sub></b>                                                                                                                                                                                                                   |         |        |                     |                              |                 | BTS Vs. QC                   |                              | BTS Vs. QV |   | <div style="border: 1px solid black; padding: 5px; width: 100px; margin: 0 auto;"> <b>Gmb<br/>X<sub>d</sub><br/>Tolerance</b><br/><br/>           0.015         </div> |   |
| 18 | Split Sample Number                                                                                                                                                                                                                     | Tonnage | QC Gmb | QV Gmb              | Difference (X <sub>d</sub> ) | BTS Referee Gmb | Difference (X <sub>d</sub> ) | Difference (X <sub>d</sub> ) |            |   |                                                                                                                                                                        |   |
| 19 | 1                                                                                                                                                                                                                                       |         |        |                     |                              |                 |                              |                              |            |   |                                                                                                                                                                        |   |
| 20 | 2                                                                                                                                                                                                                                       |         |        |                     |                              |                 |                              |                              |            |   |                                                                                                                                                                        |   |
| 21 |                                                                                                                                                                                                                                         |         |        |                     |                              |                 |                              |                              |            |   |                                                                                                                                                                        |   |
| 22 | <b>Note:</b><br>If QV Air Voids are within action limits QC data is carried into the Air Voids Pay Factor worksheet. <b>If not, BTS will conduct referee Gmm &amp; Gmb tests and BTS data will be used for subsequent calculations.</b> |         |        |                     |                              |                 | <b>Air Voids %</b>           |                              |            |   |                                                                                                                                                                        |   |
| 23 |                                                                                                                                                                                                                                         |         |        |                     |                              |                 | Contractor                   | Department                   | BTS        |   |                                                                                                                                                                        |   |
| 24 |                                                                                                                                                                                                                                         |         |        |                     |                              |                 |                              |                              |            |   |                                                                                                                                                                        |   |
| 25 |                                                                                                                                                                                                                                         |         |        |                     |                              |                 |                              |                              |            |   |                                                                                                                                                                        |   |
| 26 |                                                                                                                                                                                                                                         |         |        |                     |                              |                 |                              |                              |            |   |                                                                                                                                                                        |   |
| 27 |                                                                                                                                                                                                                                         |         |        |                     |                              |                 |                              |                              |            |   |                                                                                                                                                                        |   |

*Figure 4: SMA Split Sample Comparison data entry fields.*

The **HMA** worksheet checks for four (4) conditions to be met:

1. The paired t-test p-value for both Gmm and Gmb must be greater than alpha (0.010).
2. The Gmms for all parties must not be more than  $\pm 0.024$  from the JMF Gmm.
3. The Average Difference (X<sub>d</sub> Mean) between both QC and QV Gmms and Gmb must be less than or equal to 0.012.
4. Individual QC and QV air voids tests must meet the acceptance limits ( $1.5\% \leq V_a \leq 5.0\%$ ).

The **SMA** worksheet checks for two (2) conditions to be met:

1. The Individual Differences (X<sub>d</sub>) between both QC and QV Gmms and Gmb must be less than or equal to 0.015.
2. Individual QC and QV air voids tests must meet the acceptance limits ( $2.5\% \leq V_a \leq 6.5\%$ ).

Notes:

- For HMA:
  - BTS Referee Testing is only required if Condition 1 AND 3 are NOT MET, OR Condition 4 is NOT MET.
    - In the event BTS Referee testing is required, the BTS Referee cells' fill color (column K) will change from the dotted pattern fill to a canary/yellow color with red outlines. Enter the results of the BTS Referee testing in these cells (Figure 5).
  - If Condition 1 is NOT MET but Condition 3 IS MET, then no BTS referee testing is required.
    - In the event this situation occurs a field will automatically appear requesting the Regional PWL Representative Name that reviewed and approved the results in the field that appears below the data entry fields (Figure 6).
- For SMA:
  - BTS Referee Testing is required if Condition 1 or 2 are not met.
    - In the event BTS Referee testing is required, the BTS Referee cells' fill color (column G) will change from the dotted pattern fill to a canary/yellow color with red outlines. Enter the results of the BTS Referee testing in these cells.
- If Asphalt Content or VMA require referee testing, the BTS Referee cells' fill color will change from the dotted pattern to a canary/yellow color with red outlines, regardless if the split sample comparison itself passes.

| HMA Split Sample Comparison Testing<br>Wisconsin Department of Transportation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |            |                       |                       |                              |                     |                    |                |                 |                              |                     |                              |                     |  |  |                     |         |                       |                       |            |                    |       |       |   |                    |       |       |     |                     |         |        |        |                              |                     |                    |                |                 |                              |                     |                              |                     |   |    |       |       |       |        |   |       |  |  |  |  |  |   |     |       |       |       |  |  |  |  |  |  |  |  |   |     |       |       |       |  |  |  |  |  |  |  |  |                       |  |  |  |  |                |  |  |  |  |  |  |  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|-----------------------|-----------------------|------------------------------|---------------------|--------------------|----------------|-----------------|------------------------------|---------------------|------------------------------|---------------------|--|--|---------------------|---------|-----------------------|-----------------------|------------|--------------------|-------|-------|---|--------------------|-------|-------|-----|---------------------|---------|--------|--------|------------------------------|---------------------|--------------------|----------------|-----------------|------------------------------|---------------------|------------------------------|---------------------|---|----|-------|-------|-------|--------|---|-------|--|--|--|--|--|---|-----|-------|-------|-------|--|--|--|--|--|--|--|--|---|-----|-------|-------|-------|--|--|--|--|--|--|--|--|-----------------------|--|--|--|--|----------------|--|--|--|--|--|--|--|
| Date: 5/6/2025                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |            | Test Strip #: 1       |                       |                              |                     |                    |                |                 |                              |                     |                              |                     |  |  |                     |         |                       |                       |            |                    |       |       |   |                    |       |       |     |                     |         |        |        |                              |                     |                    |                |                 |                              |                     |                              |                     |   |    |       |       |       |        |   |       |  |  |  |  |  |   |     |       |       |       |  |  |  |  |  |  |  |  |   |     |       |       |       |  |  |  |  |  |  |  |  |                       |  |  |  |  |                |  |  |  |  |  |  |  |
| Project ID: 4-MT-58-285                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |            | Route/Road: STH 21    |                       |                              |                     |                    |                |                 |                              |                     |                              |                     |  |  |                     |         |                       |                       |            |                    |       |       |   |                    |       |       |     |                     |         |        |        |                              |                     |                    |                |                 |                              |                     |                              |                     |   |    |       |       |       |        |   |       |  |  |  |  |  |   |     |       |       |       |  |  |  |  |  |  |  |  |   |     |       |       |       |  |  |  |  |  |  |  |  |                       |  |  |  |  |                |  |  |  |  |  |  |  |
| Mix Type: 4-MT-58-285                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |            | Layer: Upper          |                       |                              |                     |                    |                |                 |                              |                     |                              |                     |  |  |                     |         |                       |                       |            |                    |       |       |   |                    |       |       |     |                     |         |        |        |                              |                     |                    |                |                 |                              |                     |                              |                     |   |    |       |       |       |        |   |       |  |  |  |  |  |   |     |       |       |       |  |  |  |  |  |  |  |  |   |     |       |       |       |  |  |  |  |  |  |  |  |                       |  |  |  |  |                |  |  |  |  |  |  |  |
| JMF Gmm: 2.523                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |            |                       |                       |                              |                     |                    |                |                 |                              |                     |                              |                     |  |  |                     |         |                       |                       |            |                    |       |       |   |                    |       |       |     |                     |         |        |        |                              |                     |                    |                |                 |                              |                     |                              |                     |   |    |       |       |       |        |   |       |  |  |  |  |  |   |     |       |       |       |  |  |  |  |  |  |  |  |   |     |       |       |       |  |  |  |  |  |  |  |  |                       |  |  |  |  |                |  |  |  |  |  |  |  |
| <p>If datasets compare and testing differences are within testing tolerance, QC data is carried into the Air Voids Pay Factor worksheet. If not, BTS will conduct referee testing and BTS data will be entered below and used for subsequent calculations.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |            |                       |                       |                              |                     |                    |                |                 |                              |                     |                              |                     |  |  |                     |         |                       |                       |            |                    |       |       |   |                    |       |       |     |                     |         |        |        |                              |                     |                    |                |                 |                              |                     |                              |                     |   |    |       |       |       |        |   |       |  |  |  |  |  |   |     |       |       |       |  |  |  |  |  |  |  |  |   |     |       |       |       |  |  |  |  |  |  |  |  |                       |  |  |  |  |                |  |  |  |  |  |  |  |
| <table border="1"> <thead> <tr> <th colspan="5">G<sub>mm</sub></th> <th colspan="4">BTS Vs. QC Results</th> <th colspan="4">BTS Vs. QV Results</th> </tr> <tr> <th>Split Sample Number</th> <th>Tonnage</th> <th>QC Gmm</th> <th>QV Gmm</th> <th>Difference (X<sub>d</sub>)</th> <th>X<sub>d</sub> Mean</th> <th>Degrees of Freedom</th> <th>t-test p-value</th> <th>BTS Referee Gmm</th> <th>Difference (X<sub>d</sub>)</th> <th>X<sub>d</sub> Mean</th> <th>Difference (X<sub>d</sub>)</th> <th>X<sub>d</sub> Mean</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>99</td> <td>2.512</td> <td>2.531</td> <td>0.019</td> <td>0.0127</td> <td>2</td> <td>0.068</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>2</td> <td>397</td> <td>2.511</td> <td>2.518</td> <td>0.007</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>3</td> <td>688</td> <td>2.509</td> <td>2.521</td> <td>0.012</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td colspan="5">Split Sample Results:</td> <td colspan="4">Do NOT Compare</td> <td colspan="4"></td> </tr> </tbody> </table> |            |                       |                       |                              |                     |                    |                |                 |                              |                     |                              |                     |  |  | G <sub>mm</sub>     |         |                       |                       |            | BTS Vs. QC Results |       |       |   | BTS Vs. QV Results |       |       |     | Split Sample Number | Tonnage | QC Gmm | QV Gmm | Difference (X <sub>d</sub> ) | X <sub>d</sub> Mean | Degrees of Freedom | t-test p-value | BTS Referee Gmm | Difference (X <sub>d</sub> ) | X <sub>d</sub> Mean | Difference (X <sub>d</sub> ) | X <sub>d</sub> Mean | 1 | 99 | 2.512 | 2.531 | 0.019 | 0.0127 | 2 | 0.068 |  |  |  |  |  | 2 | 397 | 2.511 | 2.518 | 0.007 |  |  |  |  |  |  |  |  | 3 | 688 | 2.509 | 2.521 | 0.012 |  |  |  |  |  |  |  |  | Split Sample Results: |  |  |  |  | Do NOT Compare |  |  |  |  |  |  |  |
| G <sub>mm</sub>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |            |                       |                       |                              | BTS Vs. QC Results  |                    |                |                 | BTS Vs. QV Results           |                     |                              |                     |  |  |                     |         |                       |                       |            |                    |       |       |   |                    |       |       |     |                     |         |        |        |                              |                     |                    |                |                 |                              |                     |                              |                     |   |    |       |       |       |        |   |       |  |  |  |  |  |   |     |       |       |       |  |  |  |  |  |  |  |  |   |     |       |       |       |  |  |  |  |  |  |  |  |                       |  |  |  |  |                |  |  |  |  |  |  |  |
| Split Sample Number                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Tonnage    | QC Gmm                | QV Gmm                | Difference (X <sub>d</sub> ) | X <sub>d</sub> Mean | Degrees of Freedom | t-test p-value | BTS Referee Gmm | Difference (X <sub>d</sub> ) | X <sub>d</sub> Mean | Difference (X <sub>d</sub> ) | X <sub>d</sub> Mean |  |  |                     |         |                       |                       |            |                    |       |       |   |                    |       |       |     |                     |         |        |        |                              |                     |                    |                |                 |                              |                     |                              |                     |   |    |       |       |       |        |   |       |  |  |  |  |  |   |     |       |       |       |  |  |  |  |  |  |  |  |   |     |       |       |       |  |  |  |  |  |  |  |  |                       |  |  |  |  |                |  |  |  |  |  |  |  |
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 99         | 2.512                 | 2.531                 | 0.019                        | 0.0127              | 2                  | 0.068          |                 |                              |                     |                              |                     |  |  |                     |         |                       |                       |            |                    |       |       |   |                    |       |       |     |                     |         |        |        |                              |                     |                    |                |                 |                              |                     |                              |                     |   |    |       |       |       |        |   |       |  |  |  |  |  |   |     |       |       |       |  |  |  |  |  |  |  |  |   |     |       |       |       |  |  |  |  |  |  |  |  |                       |  |  |  |  |                |  |  |  |  |  |  |  |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 397        | 2.511                 | 2.518                 | 0.007                        |                     |                    |                |                 |                              |                     |                              |                     |  |  |                     |         |                       |                       |            |                    |       |       |   |                    |       |       |     |                     |         |        |        |                              |                     |                    |                |                 |                              |                     |                              |                     |   |    |       |       |       |        |   |       |  |  |  |  |  |   |     |       |       |       |  |  |  |  |  |  |  |  |   |     |       |       |       |  |  |  |  |  |  |  |  |                       |  |  |  |  |                |  |  |  |  |  |  |  |
| 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 688        | 2.509                 | 2.521                 | 0.012                        |                     |                    |                |                 |                              |                     |                              |                     |  |  |                     |         |                       |                       |            |                    |       |       |   |                    |       |       |     |                     |         |        |        |                              |                     |                    |                |                 |                              |                     |                              |                     |   |    |       |       |       |        |   |       |  |  |  |  |  |   |     |       |       |       |  |  |  |  |  |  |  |  |   |     |       |       |       |  |  |  |  |  |  |  |  |                       |  |  |  |  |                |  |  |  |  |  |  |  |
| Split Sample Results:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |            |                       |                       |                              | Do NOT Compare      |                    |                |                 |                              |                     |                              |                     |  |  |                     |         |                       |                       |            |                    |       |       |   |                    |       |       |     |                     |         |        |        |                              |                     |                    |                |                 |                              |                     |                              |                     |   |    |       |       |       |        |   |       |  |  |  |  |  |   |     |       |       |       |  |  |  |  |  |  |  |  |   |     |       |       |       |  |  |  |  |  |  |  |  |                       |  |  |  |  |                |  |  |  |  |  |  |  |
| <p>G<sub>mm</sub> Tolerance to JMF</p> <table border="1"> <thead> <tr> <th>Split Sample Number</th> <th>Tonnage</th> <th>QC Gmm-JMF Difference</th> <th>QV Gmm-JMF Difference</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>99</td> <td>0.011</td> <td>0.008</td> </tr> <tr> <td>2</td> <td>397</td> <td>0.012</td> <td>0.005</td> </tr> <tr> <td>3</td> <td>688</td> <td>0.014</td> <td>0.002</td> </tr> </tbody> </table> <p>Gmms are within JMF Acceptance Limit.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |            |                       |                       |                              |                     |                    |                |                 |                              |                     |                              |                     |  |  | Split Sample Number | Tonnage | QC Gmm-JMF Difference | QV Gmm-JMF Difference | 1          | 99                 | 0.011 | 0.008 | 2 | 397                | 0.012 | 0.005 | 3   | 688                 | 0.014   | 0.002  |        |                              |                     |                    |                |                 |                              |                     |                              |                     |   |    |       |       |       |        |   |       |  |  |  |  |  |   |     |       |       |       |  |  |  |  |  |  |  |  |   |     |       |       |       |  |  |  |  |  |  |  |  |                       |  |  |  |  |                |  |  |  |  |  |  |  |
| Split Sample Number                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Tonnage    | QC Gmm-JMF Difference | QV Gmm-JMF Difference |                              |                     |                    |                |                 |                              |                     |                              |                     |  |  |                     |         |                       |                       |            |                    |       |       |   |                    |       |       |     |                     |         |        |        |                              |                     |                    |                |                 |                              |                     |                              |                     |   |    |       |       |       |        |   |       |  |  |  |  |  |   |     |       |       |       |  |  |  |  |  |  |  |  |   |     |       |       |       |  |  |  |  |  |  |  |  |                       |  |  |  |  |                |  |  |  |  |  |  |  |
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 99         | 0.011                 | 0.008                 |                              |                     |                    |                |                 |                              |                     |                              |                     |  |  |                     |         |                       |                       |            |                    |       |       |   |                    |       |       |     |                     |         |        |        |                              |                     |                    |                |                 |                              |                     |                              |                     |   |    |       |       |       |        |   |       |  |  |  |  |  |   |     |       |       |       |  |  |  |  |  |  |  |  |   |     |       |       |       |  |  |  |  |  |  |  |  |                       |  |  |  |  |                |  |  |  |  |  |  |  |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 397        | 0.012                 | 0.005                 |                              |                     |                    |                |                 |                              |                     |                              |                     |  |  |                     |         |                       |                       |            |                    |       |       |   |                    |       |       |     |                     |         |        |        |                              |                     |                    |                |                 |                              |                     |                              |                     |   |    |       |       |       |        |   |       |  |  |  |  |  |   |     |       |       |       |  |  |  |  |  |  |  |  |   |     |       |       |       |  |  |  |  |  |  |  |  |                       |  |  |  |  |                |  |  |  |  |  |  |  |
| 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 688        | 0.014                 | 0.002                 |                              |                     |                    |                |                 |                              |                     |                              |                     |  |  |                     |         |                       |                       |            |                    |       |       |   |                    |       |       |     |                     |         |        |        |                              |                     |                    |                |                 |                              |                     |                              |                     |   |    |       |       |       |        |   |       |  |  |  |  |  |   |     |       |       |       |  |  |  |  |  |  |  |  |   |     |       |       |       |  |  |  |  |  |  |  |  |                       |  |  |  |  |                |  |  |  |  |  |  |  |
| <table border="1"> <thead> <tr> <th colspan="5">G<sub>mb</sub></th> <th colspan="4">BTS Vs. QC Results</th> <th colspan="4">BTS Vs. QV Results</th> </tr> <tr> <th>Split Sample Number</th> <th>Tonnage</th> <th>QC Gmb</th> <th>QV Gmb</th> <th>Difference (X<sub>d</sub>)</th> <th>X<sub>d</sub> Mean</th> <th>Degrees of Freedom</th> <th>t-test p-value</th> <th>BTS Referee Gmb</th> <th>Difference (X<sub>d</sub>)</th> <th>X<sub>d</sub> Mean</th> <th>Difference (X<sub>d</sub>)</th> <th>X<sub>d</sub> Mean</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>99</td> <td>2.446</td> <td>2.454</td> <td>0.008</td> <td>0.007</td> <td>2</td> <td>0.002</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>2</td> <td>397</td> <td>2.452</td> <td>2.459</td> <td>0.007</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>3</td> <td>688</td> <td>2.448</td> <td>2.455</td> <td>0.007</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td colspan="5">Split Sample Results:</td> <td colspan="4">Do NOT Compare</td> <td colspan="4"></td> </tr> </tbody> </table>  |            |                       |                       |                              |                     |                    |                |                 |                              |                     |                              |                     |  |  | G <sub>mb</sub>     |         |                       |                       |            | BTS Vs. QC Results |       |       |   | BTS Vs. QV Results |       |       |     | Split Sample Number | Tonnage | QC Gmb | QV Gmb | Difference (X <sub>d</sub> ) | X <sub>d</sub> Mean | Degrees of Freedom | t-test p-value | BTS Referee Gmb | Difference (X <sub>d</sub> ) | X <sub>d</sub> Mean | Difference (X <sub>d</sub> ) | X <sub>d</sub> Mean | 1 | 99 | 2.446 | 2.454 | 0.008 | 0.007  | 2 | 0.002 |  |  |  |  |  | 2 | 397 | 2.452 | 2.459 | 0.007 |  |  |  |  |  |  |  |  | 3 | 688 | 2.448 | 2.455 | 0.007 |  |  |  |  |  |  |  |  | Split Sample Results: |  |  |  |  | Do NOT Compare |  |  |  |  |  |  |  |
| G <sub>mb</sub>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |            |                       |                       |                              | BTS Vs. QC Results  |                    |                |                 | BTS Vs. QV Results           |                     |                              |                     |  |  |                     |         |                       |                       |            |                    |       |       |   |                    |       |       |     |                     |         |        |        |                              |                     |                    |                |                 |                              |                     |                              |                     |   |    |       |       |       |        |   |       |  |  |  |  |  |   |     |       |       |       |  |  |  |  |  |  |  |  |   |     |       |       |       |  |  |  |  |  |  |  |  |                       |  |  |  |  |                |  |  |  |  |  |  |  |
| Split Sample Number                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Tonnage    | QC Gmb                | QV Gmb                | Difference (X <sub>d</sub> ) | X <sub>d</sub> Mean | Degrees of Freedom | t-test p-value | BTS Referee Gmb | Difference (X <sub>d</sub> ) | X <sub>d</sub> Mean | Difference (X <sub>d</sub> ) | X <sub>d</sub> Mean |  |  |                     |         |                       |                       |            |                    |       |       |   |                    |       |       |     |                     |         |        |        |                              |                     |                    |                |                 |                              |                     |                              |                     |   |    |       |       |       |        |   |       |  |  |  |  |  |   |     |       |       |       |  |  |  |  |  |  |  |  |   |     |       |       |       |  |  |  |  |  |  |  |  |                       |  |  |  |  |                |  |  |  |  |  |  |  |
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 99         | 2.446                 | 2.454                 | 0.008                        | 0.007               | 2                  | 0.002          |                 |                              |                     |                              |                     |  |  |                     |         |                       |                       |            |                    |       |       |   |                    |       |       |     |                     |         |        |        |                              |                     |                    |                |                 |                              |                     |                              |                     |   |    |       |       |       |        |   |       |  |  |  |  |  |   |     |       |       |       |  |  |  |  |  |  |  |  |   |     |       |       |       |  |  |  |  |  |  |  |  |                       |  |  |  |  |                |  |  |  |  |  |  |  |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 397        | 2.452                 | 2.459                 | 0.007                        |                     |                    |                |                 |                              |                     |                              |                     |  |  |                     |         |                       |                       |            |                    |       |       |   |                    |       |       |     |                     |         |        |        |                              |                     |                    |                |                 |                              |                     |                              |                     |   |    |       |       |       |        |   |       |  |  |  |  |  |   |     |       |       |       |  |  |  |  |  |  |  |  |   |     |       |       |       |  |  |  |  |  |  |  |  |                       |  |  |  |  |                |  |  |  |  |  |  |  |
| 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 688        | 2.448                 | 2.455                 | 0.007                        |                     |                    |                |                 |                              |                     |                              |                     |  |  |                     |         |                       |                       |            |                    |       |       |   |                    |       |       |     |                     |         |        |        |                              |                     |                    |                |                 |                              |                     |                              |                     |   |    |       |       |       |        |   |       |  |  |  |  |  |   |     |       |       |       |  |  |  |  |  |  |  |  |   |     |       |       |       |  |  |  |  |  |  |  |  |                       |  |  |  |  |                |  |  |  |  |  |  |  |
| Split Sample Results:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |            |                       |                       |                              | Do NOT Compare      |                    |                |                 |                              |                     |                              |                     |  |  |                     |         |                       |                       |            |                    |       |       |   |                    |       |       |     |                     |         |        |        |                              |                     |                    |                |                 |                              |                     |                              |                     |   |    |       |       |       |        |   |       |  |  |  |  |  |   |     |       |       |       |  |  |  |  |  |  |  |  |   |     |       |       |       |  |  |  |  |  |  |  |  |                       |  |  |  |  |                |  |  |  |  |  |  |  |
| <p>Note:</p> <p>This review is a check for reasonable test result differences between labs. Due to the small sample size, &lt;20, it is possible to have two sets of data that fail the t-test (p-value), but the "X<sub>d</sub> Means are within tolerance". For such differences, if allowed by the engineer, asphalt mix production may resume as the test result differences are based on small sample sizes and consistent testing differences. In such cases, if all Gmm are within tolerance to the JMF and both X<sub>d</sub> Means are within tolerance, QC Gmm and Gmb data will be used for analysis if the name of the Regional PWL Rep is entered in the box that reveals itself above.</p> <p>It is also possible to have two-sets of test results that are so variable that the results pass the t-test (p-value), but the "X<sub>d</sub> Mean exceeds tolerance". The cause of this type testing variation needs to be resolved before production of mix resumes.</p>                                                                                                                                                                                                         |            |                       |                       |                              |                     |                    |                |                 |                              |                     |                              |                     |  |  |                     |         |                       |                       |            |                    |       |       |   |                    |       |       |     |                     |         |        |        |                              |                     |                    |                |                 |                              |                     |                              |                     |   |    |       |       |       |        |   |       |  |  |  |  |  |   |     |       |       |       |  |  |  |  |  |  |  |  |   |     |       |       |       |  |  |  |  |  |  |  |  |                       |  |  |  |  |                |  |  |  |  |  |  |  |
| <table border="1"> <thead> <tr> <th colspan="3">Air Voids %</th> </tr> <tr> <th>Contractor</th> <th>Department</th> <th>BTS</th> </tr> </thead> <tbody> <tr> <td>2.6</td> <td>3.0</td> <td></td> </tr> <tr> <td>2.3</td> <td>2.3</td> <td></td> </tr> <tr> <td>2.4</td> <td>2.6</td> <td></td> </tr> </tbody> </table>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |            |                       |                       |                              |                     |                    |                |                 |                              |                     |                              |                     |  |  | Air Voids %         |         |                       | Contractor            | Department | BTS                | 2.6   | 3.0   |   | 2.3                | 2.3   |       | 2.4 | 2.6                 |         |        |        |                              |                     |                    |                |                 |                              |                     |                              |                     |   |    |       |       |       |        |   |       |  |  |  |  |  |   |     |       |       |       |  |  |  |  |  |  |  |  |   |     |       |       |       |  |  |  |  |  |  |  |  |                       |  |  |  |  |                |  |  |  |  |  |  |  |
| Air Voids %                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |            |                       |                       |                              |                     |                    |                |                 |                              |                     |                              |                     |  |  |                     |         |                       |                       |            |                    |       |       |   |                    |       |       |     |                     |         |        |        |                              |                     |                    |                |                 |                              |                     |                              |                     |   |    |       |       |       |        |   |       |  |  |  |  |  |   |     |       |       |       |  |  |  |  |  |  |  |  |   |     |       |       |       |  |  |  |  |  |  |  |  |                       |  |  |  |  |                |  |  |  |  |  |  |  |
| Contractor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Department | BTS                   |                       |                              |                     |                    |                |                 |                              |                     |                              |                     |  |  |                     |         |                       |                       |            |                    |       |       |   |                    |       |       |     |                     |         |        |        |                              |                     |                    |                |                 |                              |                     |                              |                     |   |    |       |       |       |        |   |       |  |  |  |  |  |   |     |       |       |       |  |  |  |  |  |  |  |  |   |     |       |       |       |  |  |  |  |  |  |  |  |                       |  |  |  |  |                |  |  |  |  |  |  |  |
| 2.6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 3.0        |                       |                       |                              |                     |                    |                |                 |                              |                     |                              |                     |  |  |                     |         |                       |                       |            |                    |       |       |   |                    |       |       |     |                     |         |        |        |                              |                     |                    |                |                 |                              |                     |                              |                     |   |    |       |       |       |        |   |       |  |  |  |  |  |   |     |       |       |       |  |  |  |  |  |  |  |  |   |     |       |       |       |  |  |  |  |  |  |  |  |                       |  |  |  |  |                |  |  |  |  |  |  |  |
| 2.3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 2.3        |                       |                       |                              |                     |                    |                |                 |                              |                     |                              |                     |  |  |                     |         |                       |                       |            |                    |       |       |   |                    |       |       |     |                     |         |        |        |                              |                     |                    |                |                 |                              |                     |                              |                     |   |    |       |       |       |        |   |       |  |  |  |  |  |   |     |       |       |       |  |  |  |  |  |  |  |  |   |     |       |       |       |  |  |  |  |  |  |  |  |                       |  |  |  |  |                |  |  |  |  |  |  |  |
| 2.4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 2.6        |                       |                       |                              |                     |                    |                |                 |                              |                     |                              |                     |  |  |                     |         |                       |                       |            |                    |       |       |   |                    |       |       |     |                     |         |        |        |                              |                     |                    |                |                 |                              |                     |                              |                     |   |    |       |       |       |        |   |       |  |  |  |  |  |   |     |       |       |       |  |  |  |  |  |  |  |  |   |     |       |       |       |  |  |  |  |  |  |  |  |                       |  |  |  |  |                |  |  |  |  |  |  |  |

Figure 5: Failed t-test and Xd Mean.

| HMA Split Sample Comparison Testing                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |            |                       |                       |                                                                                                                                                                                                                                                         |                                      |                       |                 |                              |                      |                              |                      |                    |  |  |                                  |  |  |            |            |                        |     |                     |         |                       |                       |  |                    |     |                     |         |        |        |                                       |                            |                       |                 |                              |                      |                              |                      |   |    |       |       |       |                       |               |  |  |  |  |  |   |     |       |       |       |                           |  |  |  |  |  |  |   |     |       |       |       |                                      |  |  |  |  |  |  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|-----------------------|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|-----------------------|-----------------|------------------------------|----------------------|------------------------------|----------------------|--------------------|--|--|----------------------------------|--|--|------------|------------|------------------------|-----|---------------------|---------|-----------------------|-----------------------|--|--------------------|-----|---------------------|---------|--------|--------|---------------------------------------|----------------------------|-----------------------|-----------------|------------------------------|----------------------|------------------------------|----------------------|---|----|-------|-------|-------|-----------------------|---------------|--|--|--|--|--|---|-----|-------|-------|-------|---------------------------|--|--|--|--|--|--|---|-----|-------|-------|-------|--------------------------------------|--|--|--|--|--|--|
| Wisconsin Department of Transportation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |            |                       |                       |                                                                                                                                                                                                                                                         |                                      |                       |                 |                              |                      |                              |                      |                    |  |  |                                  |  |  |            |            |                        |     |                     |         |                       |                       |  |                    |     |                     |         |        |        |                                       |                            |                       |                 |                              |                      |                              |                      |   |    |       |       |       |                       |               |  |  |  |  |  |   |     |       |       |       |                           |  |  |  |  |  |  |   |     |       |       |       |                                      |  |  |  |  |  |  |
| Date: 5/6/2025                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |            | Test Strip #: 1       |                       | If datasets compare and testing differences are within testing tolerance, QC data is carried into the Air Voids Pay Factor worksheet. If not, BTS will conduct referee testing and BTS data will be entered below and used for subsequent calculations. |                                      |                       |                 |                              |                      |                              |                      |                    |  |  |                                  |  |  |            |            |                        |     |                     |         |                       |                       |  |                    |     |                     |         |        |        |                                       |                            |                       |                 |                              |                      |                              |                      |   |    |       |       |       |                       |               |  |  |  |  |  |   |     |       |       |       |                           |  |  |  |  |  |  |   |     |       |       |       |                                      |  |  |  |  |  |  |
| Project ID: _____                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |            | Route/Road: STH 21    |                       |                                                                                                                                                                                                                                                         |                                      |                       |                 |                              |                      |                              |                      |                    |  |  |                                  |  |  |            |            |                        |     |                     |         |                       |                       |  |                    |     |                     |         |        |        |                                       |                            |                       |                 |                              |                      |                              |                      |   |    |       |       |       |                       |               |  |  |  |  |  |   |     |       |       |       |                           |  |  |  |  |  |  |   |     |       |       |       |                                      |  |  |  |  |  |  |
| Mix Type: 4-MT-58-28S                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |            | Layer: Upper          |                       |                                                                                                                                                                                                                                                         |                                      |                       |                 |                              |                      |                              |                      |                    |  |  |                                  |  |  |            |            |                        |     |                     |         |                       |                       |  |                    |     |                     |         |        |        |                                       |                            |                       |                 |                              |                      |                              |                      |   |    |       |       |       |                       |               |  |  |  |  |  |   |     |       |       |       |                           |  |  |  |  |  |  |   |     |       |       |       |                                      |  |  |  |  |  |  |
| JMF Gmm: 2.523                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |            |                       |                       |                                                                                                                                                                                                                                                         |                                      |                       |                 |                              |                      |                              |                      |                    |  |  |                                  |  |  |            |            |                        |     |                     |         |                       |                       |  |                    |     |                     |         |        |        |                                       |                            |                       |                 |                              |                      |                              |                      |   |    |       |       |       |                       |               |  |  |  |  |  |   |     |       |       |       |                           |  |  |  |  |  |  |   |     |       |       |       |                                      |  |  |  |  |  |  |
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| G <sub>mm</sub>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |                       |                       |                                                                                                                                                                                                                                                         |                                      |                       |                 |                              |                      | BTS Vs. QC Results           |                      | BTS Vs. QV Results |  |  |                                  |  |  |            |            |                        |     |                     |         |                       |                       |  |                    |     |                     |         |        |        |                                       |                            |                       |                 |                              |                      |                              |                      |   |    |       |       |       |                       |               |  |  |  |  |  |   |     |       |       |       |                           |  |  |  |  |  |  |   |     |       |       |       |                                      |  |  |  |  |  |  |
| Split Sample Number                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Tonnage    | QC Gmm                | QV Gmm                | Difference [X <sub>d</sub> ]                                                                                                                                                                                                                            | X <sub>d</sub> Mean: 0.010           | Degrees of Freedom: 2 | BTS Referee Gmm | Difference [X <sub>d</sub> ] | X <sub>d</sub> Mean: | Difference [X <sub>d</sub> ] | X <sub>d</sub> Mean: |                    |  |  |                                  |  |  |            |            |                        |     |                     |         |                       |                       |  |                    |     |                     |         |        |        |                                       |                            |                       |                 |                              |                      |                              |                      |   |    |       |       |       |                       |               |  |  |  |  |  |   |     |       |       |       |                           |  |  |  |  |  |  |   |     |       |       |       |                                      |  |  |  |  |  |  |
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 99         | 2.512                 | 2.522                 | 0.010                                                                                                                                                                                                                                                   | t-test p-value: 0.022                | Prob. α 0.010         |                 |                              |                      |                              |                      |                    |  |  |                                  |  |  |            |            |                        |     |                     |         |                       |                       |  |                    |     |                     |         |        |        |                                       |                            |                       |                 |                              |                      |                              |                      |   |    |       |       |       |                       |               |  |  |  |  |  |   |     |       |       |       |                           |  |  |  |  |  |  |   |     |       |       |       |                                      |  |  |  |  |  |  |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 397        | 2.511                 | 2.518                 | 0.007                                                                                                                                                                                                                                                   | Xd Mean within tolerance.            |                       |                 |                              |                      |                              |                      |                    |  |  |                                  |  |  |            |            |                        |     |                     |         |                       |                       |  |                    |     |                     |         |        |        |                                       |                            |                       |                 |                              |                      |                              |                      |   |    |       |       |       |                       |               |  |  |  |  |  |   |     |       |       |       |                           |  |  |  |  |  |  |   |     |       |       |       |                                      |  |  |  |  |  |  |
| 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 688        | 2.509                 | 2.521                 | 0.012                                                                                                                                                                                                                                                   | Split Sample Results: Compare        |                       |                 |                              |                      |                              |                      |                    |  |  |                                  |  |  |            |            |                        |     |                     |         |                       |                       |  |                    |     |                     |         |        |        |                                       |                            |                       |                 |                              |                      |                              |                      |   |    |       |       |       |                       |               |  |  |  |  |  |   |     |       |       |       |                           |  |  |  |  |  |  |   |     |       |       |       |                                      |  |  |  |  |  |  |
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| G <sub>mm</sub> Tolerance to JMF                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |            |                       |                       |                                                                                                                                                                                                                                                         | BTS Gmm-JMF Difference               |                       |                 |                              |                      |                              |                      |                    |  |  |                                  |  |  |            |            |                        |     |                     |         |                       |                       |  |                    |     |                     |         |        |        |                                       |                            |                       |                 |                              |                      |                              |                      |   |    |       |       |       |                       |               |  |  |  |  |  |   |     |       |       |       |                           |  |  |  |  |  |  |   |     |       |       |       |                                      |  |  |  |  |  |  |
| Split Sample Number                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Tonnage    | QC Gmm-JMF Difference | QV Gmm-JMF Difference |                                                                                                                                                                                                                                                         |                                      |                       |                 |                              |                      |                              |                      |                    |  |  |                                  |  |  |            |            |                        |     |                     |         |                       |                       |  |                    |     |                     |         |        |        |                                       |                            |                       |                 |                              |                      |                              |                      |   |    |       |       |       |                       |               |  |  |  |  |  |   |     |       |       |       |                           |  |  |  |  |  |  |   |     |       |       |       |                                      |  |  |  |  |  |  |
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 99         | 0.011                 | 0.001                 | Gmms are within JMF Acceptance Limit.                                                                                                                                                                                                                   |                                      |                       |                 |                              |                      |                              |                      |                    |  |  |                                  |  |  |            |            |                        |     |                     |         |                       |                       |  |                    |     |                     |         |        |        |                                       |                            |                       |                 |                              |                      |                              |                      |   |    |       |       |       |                       |               |  |  |  |  |  |   |     |       |       |       |                           |  |  |  |  |  |  |   |     |       |       |       |                                      |  |  |  |  |  |  |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 397        | 0.012                 | 0.005                 |                                                                                                                                                                                                                                                         |                                      |                       |                 |                              |                      |                              |                      |                    |  |  |                                  |  |  |            |            |                        |     |                     |         |                       |                       |  |                    |     |                     |         |        |        |                                       |                            |                       |                 |                              |                      |                              |                      |   |    |       |       |       |                       |               |  |  |  |  |  |   |     |       |       |       |                           |  |  |  |  |  |  |   |     |       |       |       |                                      |  |  |  |  |  |  |
| 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 688        | 0.014                 | 0.002                 |                                                                                                                                                                                                                                                         |                                      |                       |                 |                              |                      |                              |                      |                    |  |  |                                  |  |  |            |            |                        |     |                     |         |                       |                       |  |                    |     |                     |         |        |        |                                       |                            |                       |                 |                              |                      |                              |                      |   |    |       |       |       |                       |               |  |  |  |  |  |   |     |       |       |       |                           |  |  |  |  |  |  |   |     |       |       |       |                                      |  |  |  |  |  |  |
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| G <sub>mb</sub>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |                       |                       |                                                                                                                                                                                                                                                         |                                      |                       |                 |                              |                      | BTS Vs. QC Results           |                      | BTS Vs. QV Results |  |  |                                  |  |  |            |            |                        |     |                     |         |                       |                       |  |                    |     |                     |         |        |        |                                       |                            |                       |                 |                              |                      |                              |                      |   |    |       |       |       |                       |               |  |  |  |  |  |   |     |       |       |       |                           |  |  |  |  |  |  |   |     |       |       |       |                                      |  |  |  |  |  |  |
| Split Sample Number                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Tonnage    | QC Gmb                | QV Gmb                | Difference [X <sub>d</sub> ]                                                                                                                                                                                                                            | X <sub>d</sub> Mean: 0.007           | Degrees of Freedom: 2 | BTS Referee Gmb | Difference [X <sub>d</sub> ] | X <sub>d</sub> Mean: | Difference [X <sub>d</sub> ] | X <sub>d</sub> Mean: |                    |  |  |                                  |  |  |            |            |                        |     |                     |         |                       |                       |  |                    |     |                     |         |        |        |                                       |                            |                       |                 |                              |                      |                              |                      |   |    |       |       |       |                       |               |  |  |  |  |  |   |     |       |       |       |                           |  |  |  |  |  |  |   |     |       |       |       |                                      |  |  |  |  |  |  |
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 99         | 2.446                 | 2.454                 | 0.008                                                                                                                                                                                                                                                   | t-test p-value: 0.902                | Prob. α 0.010         |                 |                              |                      |                              |                      |                    |  |  |                                  |  |  |            |            |                        |     |                     |         |                       |                       |  |                    |     |                     |         |        |        |                                       |                            |                       |                 |                              |                      |                              |                      |   |    |       |       |       |                       |               |  |  |  |  |  |   |     |       |       |       |                           |  |  |  |  |  |  |   |     |       |       |       |                                      |  |  |  |  |  |  |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 397        | 2.452                 | 2.459                 | 0.007                                                                                                                                                                                                                                                   | Xd Mean within tolerance.            |                       |                 |                              |                      |                              |                      |                    |  |  |                                  |  |  |            |            |                        |     |                     |         |                       |                       |  |                    |     |                     |         |        |        |                                       |                            |                       |                 |                              |                      |                              |                      |   |    |       |       |       |                       |               |  |  |  |  |  |   |     |       |       |       |                           |  |  |  |  |  |  |   |     |       |       |       |                                      |  |  |  |  |  |  |
| 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 688        | 2.448                 | 2.455                 | 0.007                                                                                                                                                                                                                                                   | Split Sample Results: Do NOT Compare |                       |                 |                              |                      |                              |                      |                    |  |  |                                  |  |  |            |            |                        |     |                     |         |                       |                       |  |                    |     |                     |         |        |        |                                       |                            |                       |                 |                              |                      |                              |                      |   |    |       |       |       |                       |               |  |  |  |  |  |   |     |       |       |       |                           |  |  |  |  |  |  |   |     |       |       |       |                                      |  |  |  |  |  |  |
| <p>Note: This review is a check for reasonable test result differences between labs. Due to the small sample size, &lt;20, it is possible to have two sets of data that fail the t-test (p-value), but the "Xd Means are within tolerance". For such differences, if allowed by the engineer, asphalt mix production may resume as the test result differences are based on small sample sizes and consistent testing differences. In such cases, if all Gmm are within tolerance to the JMF and both Xd Means are within tolerance, QC Gmm and Gmb data will be used for analysis if the name of the Regional PWL Rep is entered in the box that reveals itself above.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                 |            |                       |                       |                                                                                                                                                                                                                                                         |                                      |                       |                 |                              |                      |                              |                      |                    |  |  |                                  |  |  |            |            |                        |     |                     |         |                       |                       |  |                    |     |                     |         |        |        |                                       |                            |                       |                 |                              |                      |                              |                      |   |    |       |       |       |                       |               |  |  |  |  |  |   |     |       |       |       |                           |  |  |  |  |  |  |   |     |       |       |       |                                      |  |  |  |  |  |  |
| <table border="1"> <thead> <tr> <th colspan="3">Air Voids %</th> </tr> <tr> <th>Contractor</th> <th>Department</th> <th>BTS</th> </tr> </thead> <tbody> <tr> <td>2.6</td> <td>2.7</td> <td></td> </tr> <tr> <td>2.3</td> <td>2.3</td> <td></td> </tr> <tr> <td>2.4</td> <td>2.6</td> <td></td> </tr> </tbody> </table>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |            |                       |                       |                                                                                                                                                                                                                                                         |                                      |                       |                 |                              |                      |                              |                      |                    |  |  | Air Voids %                      |  |  | Contractor | Department | BTS                    | 2.6 | 2.7                 |         | 2.3                   | 2.3                   |  | 2.4                | 2.6 |                     |         |        |        |                                       |                            |                       |                 |                              |                      |                              |                      |   |    |       |       |       |                       |               |  |  |  |  |  |   |     |       |       |       |                           |  |  |  |  |  |  |   |     |       |       |       |                                      |  |  |  |  |  |  |
| Air Voids %                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |            |                       |                       |                                                                                                                                                                                                                                                         |                                      |                       |                 |                              |                      |                              |                      |                    |  |  |                                  |  |  |            |            |                        |     |                     |         |                       |                       |  |                    |     |                     |         |        |        |                                       |                            |                       |                 |                              |                      |                              |                      |   |    |       |       |       |                       |               |  |  |  |  |  |   |     |       |       |       |                           |  |  |  |  |  |  |   |     |       |       |       |                                      |  |  |  |  |  |  |
| Contractor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Department | BTS                   |                       |                                                                                                                                                                                                                                                         |                                      |                       |                 |                              |                      |                              |                      |                    |  |  |                                  |  |  |            |            |                        |     |                     |         |                       |                       |  |                    |     |                     |         |        |        |                                       |                            |                       |                 |                              |                      |                              |                      |   |    |       |       |       |                       |               |  |  |  |  |  |   |     |       |       |       |                           |  |  |  |  |  |  |   |     |       |       |       |                                      |  |  |  |  |  |  |
| 2.6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 2.7        |                       |                       |                                                                                                                                                                                                                                                         |                                      |                       |                 |                              |                      |                              |                      |                    |  |  |                                  |  |  |            |            |                        |     |                     |         |                       |                       |  |                    |     |                     |         |        |        |                                       |                            |                       |                 |                              |                      |                              |                      |   |    |       |       |       |                       |               |  |  |  |  |  |   |     |       |       |       |                           |  |  |  |  |  |  |   |     |       |       |       |                                      |  |  |  |  |  |  |
| 2.3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 2.3        |                       |                       |                                                                                                                                                                                                                                                         |                                      |                       |                 |                              |                      |                              |                      |                    |  |  |                                  |  |  |            |            |                        |     |                     |         |                       |                       |  |                    |     |                     |         |        |        |                                       |                            |                       |                 |                              |                      |                              |                      |   |    |       |       |       |                       |               |  |  |  |  |  |   |     |       |       |       |                           |  |  |  |  |  |  |   |     |       |       |       |                                      |  |  |  |  |  |  |
| 2.4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 2.6        |                       |                       |                                                                                                                                                                                                                                                         |                                      |                       |                 |                              |                      |                              |                      |                    |  |  |                                  |  |  |            |            |                        |     |                     |         |                       |                       |  |                    |     |                     |         |        |        |                                       |                            |                       |                 |                              |                      |                              |                      |   |    |       |       |       |                       |               |  |  |  |  |  |   |     |       |       |       |                           |  |  |  |  |  |  |   |     |       |       |       |                                      |  |  |  |  |  |  |

Figure 6: Failed t-test but Xd Mean and Gmm All Within Tolerance.

## 6. Core Data

This worksheet only appears when either “Combined Density and Volumetrics” (Figure 7 and Figure 8) or “Density-Only” is selected as the Test Strip Type on the *Project Info & Instruction* worksheet. The correct version of this worksheet will appear for either HMA or SMA based on the Mix Type entered on the *Project Info & Instruction* worksheet. This worksheet is used to enter the mainline density test results obtained by cores.

The Department Representative will enter the following information from the core density testing:

- For **HMA**:
  - Contractor Dry Weight (g)
  - Contractor SSD Weight (g)
  - Contractor Submerged Weight (g)
  - Department Dry Weight (g) (if performed)
  - Department SSD Weight (g) (if performed)
  - Department Submerged Weight (g) (if performed)
- For **SMA**:
  - Contractor Bag Weight (g)
  - Contractor Dry Specimen W/O Bag (g)
  - Contractor Sealed Sample Submerged (g)
  - Contractor Specimen After Removal from Bag (g)
  - Department Bag Weight (g) (if performed)
  - Department Dry Specimen W/O Bag (g) (if performed)
  - Department Sealed Sample Submerged (g) (if performed)
  - Department Specimen After Removal from Bag (g) (if performed)
- QC or QV Core Data Used For Analysis (option available when Department enters optional core verification results)
- Suspect Core Removal (if needed)

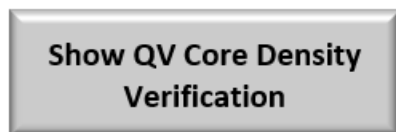
| A  | B                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | C              | D              | E              | F              | G                       | H                    | I                   | J                          | W |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------------|----------------|----------------|-------------------------|----------------------|---------------------|----------------------------|---|
| 1  | <h2 style="margin: 0;">HMA Core Testing</h2> <h3 style="margin: 0;">Wisconsin Department of Transportation</h3>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                |                |                |                |                         |                      |                     |                            |   |
| 2  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                |                |                |                |                         |                      |                     |                            |   |
| 3  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                |                |                |                |                         |                      |                     |                            |   |
| 4  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                |                |                |                |                         |                      |                     |                            |   |
| 5  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                |                |                |                |                         |                      |                     |                            |   |
| 6  | Date: _____                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                |                |                |                | Test Strip #: _____     |                      |                     |                            |   |
| 7  | Project ID: _____                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                |                |                |                | Route/Road: _____       |                      |                     |                            |   |
| 8  | Mix Type: _____                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                |                |                |                | Layer: _____            |                      |                     |                            |   |
| 9  | Gmm For Analysis: _____                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                |                |                |                | LSL: 93.0               |                      |                     |                            |   |
| 10 | Gmm Source: QC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                |                |                |                | JMF Gmm: Enter JMF Gmm. |                      |                     |                            |   |
| 11 | Show QV Core Density Verification                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                |                |                |                |                         |                      |                     |                            |   |
| 12 | Contractor Core Density Calculations                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                |                |                |                |                         |                      |                     |                            |   |
| 13 | Label                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Random Station | Offset from CL | Dry Weight (g) | SSD Weight (g) | Submerged Weight (g)    | QC Core Bulk Density | QC Density % of Gmm | Location Comparison Result |   |
| 14 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | -01+00         |                |                |                |                         |                      |                     |                            |   |
| 15 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | -00+50         |                |                |                |                         |                      |                     |                            |   |
| 16 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 00+00          |                |                |                |                         |                      |                     |                            |   |
| 17 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 00+50          |                |                |                |                         |                      |                     |                            |   |
| 18 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 01+00          |                |                |                |                         |                      |                     |                            |   |
| 19 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Random Station | Offset from CL | Dry Weight (g) | SSD Weight (g) | Submerged Weight (g)    | QC Core Bulk Density | QC Density % of Gmm | Location Comparison Result |   |
| 20 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | -01+00         |                |                |                |                         |                      |                     |                            |   |
| 21 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | -00+50         |                |                |                |                         |                      |                     |                            |   |
| 22 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 00+00          |                |                |                |                         |                      |                     |                            |   |
| 23 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 00+50          |                |                |                |                         |                      |                     |                            |   |
| 24 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 01+00          |                |                |                |                         |                      |                     |                            |   |
| 25 | Average:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                |                |                |                |                         |                      |                     |                            |   |
| 26 | <p><b>Note:</b></p> <p>The Location Comparison Result references values on the Gauge-Core Variability worksheet comparing the core density data with each adjusted nuclear density gauge reading at each test location. "Suspect Core" is displayed under Location Comparison Result if the Location Comparison average is <math>\geq 1.0</math> or <math>\leq -1.0</math> this indicates a core that may be damaged. Contact the Regional PWL Representative when a "Suspect Core" is identified here or when core density values are considered questionable. <b>ONLY THE REGIONAL PWL REPRESENTATIVE CAN REMOVE A CORE FROM ANALYSIS.</b></p> |                |                |                |                |                         |                      |                     |                            |   |
| 27 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                |                |                |                |                         |                      |                     |                            |   |
| 28 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                |                |                |                |                         |                      |                     |                            |   |
| 29 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                |                |                |                |                         |                      |                     |                            |   |
| 30 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                |                |                |                |                         |                      |                     |                            |   |
| 31 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                |                |                |                |                         |                      |                     |                            |   |
| 32 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                |                |                |                |                         |                      |                     |                            |   |
| 33 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                |                |                |                |                         |                      |                     |                            |   |
| 34 | <b>Comments:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                |                |                |                |                         |                      |                     |                            |   |
| 35 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                |                |                |                |                         |                      |                     |                            |   |
| 36 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                |                |                |                |                         |                      |                     |                            |   |
| 37 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                |                |                |                |                         |                      |                     |                            |   |
| 38 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                |                |                |                |                         |                      |                     |                            |   |
| 39 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                |                |                |                |                         |                      |                     |                            |   |

Figure 7: HMA Core Data Fields.

|    | A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | B              | C              | D              | E                        | F                           | G                                   | H                    | I                                            | J                          | K | Y |
|----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------------|----------------|--------------------------|-----------------------------|-------------------------------------|----------------------|----------------------------------------------|----------------------------|---|---|
| 1  |  <b>SMA Core Testing</b><br>Wisconsin Department of Transportation                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                |                |                |                          |                             |                                     |                      |                                              |                            |   |   |
| 2  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                |                |                |                          |                             |                                     |                      |                                              |                            |   |   |
| 3  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                |                |                |                          |                             |                                     |                      |                                              |                            |   |   |
| 4  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                |                |                |                          |                             |                                     |                      |                                              |                            |   |   |
| 5  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                |                |                |                          |                             |                                     |                      |                                              |                            |   |   |
| 6  | Date: _____                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                |                |                | Test Strip #: _____      |                             |                                     |                      |                                              |                            |   |   |
| 7  | Project ID: _____                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                |                |                | Route/Road: _____        |                             |                                     |                      |                                              |                            |   |   |
| 8  | Mix Type: _____ -SMA-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                |                |                | Layer: _____             |                             |                                     |                      |                                              |                            |   |   |
| 9  | Gmm For Analysis: _____                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                |                |                | LSL: 93.0                |                             |                                     |                      | <div>Show QV Core Density Verification</div> |                            |   |   |
| 10 | Gmm Source: QC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                |                |                | JMF Gmm: Enter JMF Gmm.  |                             |                                     |                      |                                              |                            |   |   |
| 11 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                |                |                |                          |                             |                                     |                      |                                              |                            |   |   |
| 12 | Contractor Core Density Calculations                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                |                |                |                          |                             |                                     |                      |                                              |                            |   |   |
| 13 | Label                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Random Station | Offset from CL | Bag Weight (g) | Dry Specimen W/O Bag (g) | Sealed Sample Submerged (g) | Specimen after removal from bag (g) | QC Core Bulk Density | QC Density % of Gmm                          | Location Comparison Result |   |   |
| 14 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | -01+00         |                |                |                          |                             |                                     |                      |                                              |                            |   |   |
| 15 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | -00+50         |                |                |                          |                             |                                     |                      |                                              |                            |   |   |
| 16 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 00+00          |                |                |                          |                             |                                     |                      |                                              |                            |   |   |
| 17 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 00+50          |                |                |                          |                             |                                     |                      |                                              |                            |   |   |
| 18 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 01+00          |                |                |                          |                             |                                     |                      |                                              |                            |   |   |
| 19 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                |                |                |                          |                             |                                     |                      |                                              |                            |   |   |
| 20 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Random Station | Offset from CL | Bag Weight (g) | Dry Specimen W/O Bag (g) | Sealed Sample Submerged (g) | Specimen after removal from bag (g) | QC Core Bulk Density | QC Density % of Gmm                          | Location Comparison Result |   |   |
| 21 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | -01+00         |                |                |                          |                             |                                     |                      |                                              |                            |   |   |
| 22 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | -00+50         |                |                |                          |                             |                                     |                      |                                              |                            |   |   |
| 23 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 00+00          |                |                |                          |                             |                                     |                      |                                              |                            |   |   |
| 24 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 00+50          |                |                |                          |                             |                                     |                      |                                              |                            |   |   |
| 25 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 01+00          |                |                |                          |                             |                                     |                      |                                              |                            |   |   |
| 26 | Average:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                |                |                |                          |                             |                                     |                      |                                              |                            |   |   |
| 27 | <b>Note:</b><br>The Location Comparison Result references values on the Gauge-Core Variability Tab comparing the core density data with each adjusted nuclear density gauge reading at each test location. "Suspect Core" is displayed under Location Comparison Result if the Location Comparison average is $\geq 1.0$ or $\leq -1.0$ this indicates a core that may be damaged. Contact the Regional TSS Representative when a "Suspect Core" is identified here or when core density values are considered questionable. <b>ONLY THE REGIONAL TSS REPRESENTATIVE CAN REMOVE A CORE FROM ANALYSIS.</b> |                |                |                |                          |                             |                                     |                      |                                              |                            |   |   |
| 28 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                |                |                |                          |                             |                                     |                      |                                              |                            |   |   |
| 29 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                |                |                |                          |                             |                                     |                      |                                              |                            |   |   |
| 30 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                |                |                |                          |                             |                                     |                      |                                              |                            |   |   |
| 31 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                |                |                |                          |                             |                                     |                      |                                              |                            |   |   |
| 32 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                |                |                |                          |                             |                                     |                      |                                              |                            |   |   |
| 33 | <div>PWL Rep Suspect Core Review</div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                |                |                |                          |                             |                                     |                      |                                              |                            |   |   |
| 34 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                |                |                |                          |                             |                                     |                      |                                              |                            |   |   |
| 35 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                |                |                |                          |                             |                                     |                      |                                              |                            |   |   |
| 36 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                |                |                |                          |                             |                                     |                      |                                              |                            |   |   |
| 37 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                |                |                |                          |                             |                                     |                      |                                              |                            |   |   |

Figure 8: SMA Core Data Fields.

The department may decide to perform optional density verification of the contractor's results. If the department performs this testing, the results can be entered by pressing the



button to reveal the data entry fields (Figure 9). Additionally, the Department Representative, at their discretion, can select which data set, QC or QV, to use for acceptance, pay adjustment, and nuclear gauge correlation.

Notes:

- It is recommended to use QV results for analysis if the *Difference in Average % Density* (cell V26 for HMA Core Data) is more than 0.5%.

**HMA Core Testing**  
Wisconsin Department of Transportation

Date: \_\_\_\_\_ Test Strip #: \_\_\_\_\_  
 Project ID: \_\_\_\_\_ Route/Road: \_\_\_\_\_  
 Mix Type: \_\_\_\_\_ Layer: \_\_\_\_\_  
 Gmm For Analysis: \_\_\_\_\_ LSL: 93.0  
 Gmm Source: QC JMF Gmm: Enter JMF Gmm.

**Show QV Core Density Verification** **Hide QV Core Density Verification**

QC or QV Core Data Used For Analysis? ☐ QC ☐ QV

| Contractor Core Density Calculations |                |                |                |                      |                      |                     | Department Core Density Calculations |                |                |                      |                      | Department Minus Contractor Density Data |                                  |     |           |                   |           |
|--------------------------------------|----------------|----------------|----------------|----------------------|----------------------|---------------------|--------------------------------------|----------------|----------------|----------------------|----------------------|------------------------------------------|----------------------------------|-----|-----------|-------------------|-----------|
| Random Station                       | Offset from CL | Dry Weight (g) | SSD Weight (g) | Submerged Weight (g) | QC Core Bulk Density | QC Density % of Gmm | Location Comparison Result           | Dry Weight (g) | SSD Weight (g) | Submerged Weight (g) | QV Core Bulk Density | QV Density % of Gmm                      | Dry                              | SSD | Submerged | Core Bulk Density | Density % |
| -01+00                               |                |                |                |                      |                      |                     |                                      |                |                |                      |                      |                                          |                                  |     |           |                   |           |
| -00+50                               |                |                |                |                      |                      |                     |                                      |                |                |                      |                      |                                          |                                  |     |           |                   |           |
| 00+00                                |                |                |                |                      |                      |                     |                                      |                |                |                      |                      |                                          |                                  |     |           |                   |           |
| 00+50                                |                |                |                |                      |                      |                     |                                      |                |                |                      |                      |                                          |                                  |     |           |                   |           |
| 01+00                                |                |                |                |                      |                      |                     |                                      |                |                |                      |                      |                                          |                                  |     |           |                   |           |
| Average:                             |                |                |                |                      |                      |                     |                                      | Average:       |                |                      |                      |                                          | Difference in Average % Density: |     |           |                   |           |

**Note:**  
 The Location Comparison Result references values on the Gauge-Core Variability worksheet comparing the core density data with each adjusted nuclear density gauge reading at each test location. "Suspect Core" is displayed under Location Comparison Result if the Location Comparison average is  $\geq 1.0$  or  $\leq -1.0$  this indicates a core that may be damaged. Contact the Regional PWL Representative when a "Suspect Core" is identified here or when core density values are considered questionable. **ONLY THE REGIONAL PWL REPRESENTATIVE CAN REMOVE A CORE FROM ANALYSIS.**

**PWL Rep Suspect Core Review**

If the difference between the QC and QV average densities is greater than 0.5%, consider using QV core densities in place of QC core densities.

Comments: \_\_\_\_\_

Figure 9: Optional Department Verification of Cores.

Comments regarding the testing can be entered at the bottom of the worksheet in the provided field.

After this worksheet and the QC and QV density worksheets have been filled out, the *Gauge-Core Variability* worksheet may flag some cores as suspect (further discussed in section 12 Gauge-Core Variability). In the event cores have been flagged suspect, the *Location Comparison Result* next to the applicable core will say "Suspect Core (X.X%)" (where X.X will be the average location comparison result). The Department Representative may remove suspect cores

**PWL Rep  
Suspect Core  
Review**

from the analysis by clicking the button. This will reveal the options to remove the suspect cores (Figure 10). Simply click the checkbox next to the suspect cores to remove them from the analysis.

Notes:

- Remove suspect cores starting with the core with the largest *Location Comparison Average*. Sometimes not all the cores that were originally flagged will remain flagged once the core with the largest *Location Comparison Average* is removed. This information will also appear in a pop-up when the PWL Rep Suspect Core Review button is pressed.

|    | A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | B              | C               | D              | E                                                                                                                  | F                    | G                    | H                   | I                          | J                               | K | L |
|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-----------------|----------------|--------------------------------------------------------------------------------------------------------------------|----------------------|----------------------|---------------------|----------------------------|---------------------------------|---|---|
| 1  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                |                 |                |                                                                                                                    |                      |                      |                     |                            |                                 |   |   |
| 2  | <div style="display: flex; align-items: center;"> <div> <h2 style="margin: 0;">HMA Core Testing</h2> <h3 style="margin: 0;">Wisconsin Department of Transportation</h3> </div> </div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                |                 |                |                                                                                                                    |                      |                      |                     |                            |                                 |   |   |
| 3  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                |                 |                |                                                                                                                    |                      |                      |                     |                            |                                 |   |   |
| 4  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                |                 |                |                                                                                                                    |                      |                      |                     |                            |                                 |   |   |
| 5  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                |                 |                |                                                                                                                    |                      |                      |                     |                            |                                 |   |   |
| 6  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                |                 |                |                                                                                                                    |                      |                      |                     |                            |                                 |   |   |
| 7  | Date: 9/23/2025                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                | Test Strip #: 1 |                |                                                                                                                    |                      |                      |                     |                            |                                 |   |   |
| 8  | Project ID:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                | Route/Road:     |                |                                                                                                                    |                      |                      |                     |                            |                                 |   |   |
| 9  | Mix Type: 4-MT-58-28S                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                | Layer: Upper    |                |                                                                                                                    |                      |                      |                     |                            |                                 |   |   |
| 10 | Gmm For Analysis: 2.457                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                | LSL: 93.0       |                | <div style="border: 1px solid black; padding: 5px; display: inline-block;">Show QV Core Density Verification</div> |                      |                      |                     |                            |                                 |   |   |
| 11 | Gmm Source: QC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                | JMF Gmm: 2.473  |                |                                                                                                                    |                      |                      |                     |                            |                                 |   |   |
| 12 | Contractor Core Density Calculations                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                |                 |                |                                                                                                                    |                      |                      |                     |                            |                                 |   |   |
| 13 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Random Station | Offset from CL  | Dry Weight (g) | SSD Weight (g)                                                                                                     | Submerged Weight (g) | QC Core Bulk Density | QC Density % of Gmm | Location Comparison Result | Remove Core Data From Analysis? |   |   |
| 14 | UL-1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 393+73         | 1.5             | 979.9          | 981.0                                                                                                              | 558.6                | 2.320                | 94.4                | Suspect Core (1.2%)        | <input type="checkbox"/>        |   |   |
| 15 | UL-2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 393+23         | 3.5             | 993.0          | 993.2                                                                                                              | 565.4                | 2.321                | 94.5                | Suspect Core (1.0%)        | <input type="checkbox"/>        |   |   |
| 16 | UL-3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 392+73         | 6.0             | 997.3          | 1,002.3                                                                                                            | 554.3                | 2.226                | 90.6                | Suspect Core (-3.3%)       | <input type="checkbox"/>        |   |   |
| 17 | UL-4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 392+23         | 8.5             | 1,035.6        | 1,036.2                                                                                                            | 591.7                | 2.330                | 94.8                | Suspect Core (1.1%)        | <input type="checkbox"/>        |   |   |
| 18 | UL-5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 391+73         | 10.5            | 987.4          | 989.2                                                                                                              | 555.4                | 2.276                | 92.6                | Suspect Core (-1.3%)       | <input type="checkbox"/>        |   |   |
| 19 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                |                 |                |                                                                                                                    |                      |                      |                     |                            |                                 |   |   |
| 20 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Random Station | Offset from CL  | Dry Weight (g) | SSD Weight (g)                                                                                                     | Submerged Weight (g) | QC Core Bulk Density | QC Density % of Gmm | Location Comparison Result | Remove Core Data From Analysis? |   |   |
| 21 | UL-6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 385+48         | 1.5             | 1,021.3        | 1,022.2                                                                                                            | 579.6                | 2.308                | 93.9                |                            | <input type="checkbox"/>        |   |   |
| 22 | UL-7                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 384+98         | 3.5             | 1,069.6        | 1,070.2                                                                                                            | 612.8                | 2.338                | 95.2                |                            | <input type="checkbox"/>        |   |   |
| 23 | UL-8                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 384+48         | 6.0             | 1,085.3        | 1,085.8                                                                                                            | 619.9                | 2.329                | 94.8                |                            | <input type="checkbox"/>        |   |   |
| 24 | UL-9                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 383+98         | 8.5             | 935.5          | 936.9                                                                                                              | 530.1                | 2.300                | 93.6                |                            | <input type="checkbox"/>        |   |   |
| 25 | UL-10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 383+48         | 10.5            | 997.3          | 998.6                                                                                                              | 563.4                | 2.292                | 93.3                |                            | <input type="checkbox"/>        |   |   |
| 26 | Average: 2.304 93.8                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                |                 |                |                                                                                                                    |                      |                      |                     |                            |                                 |   |   |
| 27 | <div style="display: flex; justify-content: space-between;"> <div> <p><b>Note:</b></p> <p>The Location Comparison Result references values on the Gauge-Core Variability worksheet comparing the core density data with each adjusted nuclear density gauge reading at each test location. "Suspect Core" is displayed under Location Comparison Result if the Location Comparison average is <math>\geq 1.0</math> or <math>\leq -1.0</math> this indicates a core that may be damaged. Contact the Regional PWL Representative when a "Suspect Core" is identified here or when core density values are considered questionable. <b>ONLY THE REGIONAL PWL REPRESENTATIVE CAN REMOVE A CORE FROM ANALYSIS.</b></p> </div> <div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 5px; margin-right: 10px; text-align: center;"> <b>PWL Rep<br/>Suspect Core<br/>Review</b> </div> <div style="border: 1px solid black; padding: 5px; margin-right: 10px; text-align: center;"> <b>Hide Core<br/>Review</b> </div> </div> </div> |                |                 |                |                                                                                                                    |                      |                      |                     |                            |                                 |   |   |
| 28 | <p><b>Comments:</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                |                 |                |                                                                                                                    |                      |                      |                     |                            |                                 |   |   |
| 29 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                |                 |                |                                                                                                                    |                      |                      |                     |                            |                                 |   |   |
| 30 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                |                 |                |                                                                                                                    |                      |                      |                     |                            |                                 |   |   |
| 31 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                |                 |                |                                                                                                                    |                      |                      |                     |                            |                                 |   |   |
| 32 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                |                 |                |                                                                                                                    |                      |                      |                     |                            |                                 |   |   |
| 33 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                |                 |                |                                                                                                                    |                      |                      |                     |                            |                                 |   |   |
| 34 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                |                 |                |                                                                                                                    |                      |                      |                     |                            |                                 |   |   |
| 35 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                |                 |                |                                                                                                                    |                      |                      |                     |                            |                                 |   |   |
| 36 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                |                 |                |                                                                                                                    |                      |                      |                     |                            |                                 |   |   |
| 37 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                |                 |                |                                                                                                                    |                      |                      |                     |                            |                                 |   |   |
| 38 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                |                 |                |                                                                                                                    |                      |                      |                     |                            |                                 |   |   |
| 39 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                |                 |                |                                                                                                                    |                      |                      |                     |                            |                                 |   |   |

Figure 10: Suspect Core Review Interface.



## 7. AC % Data

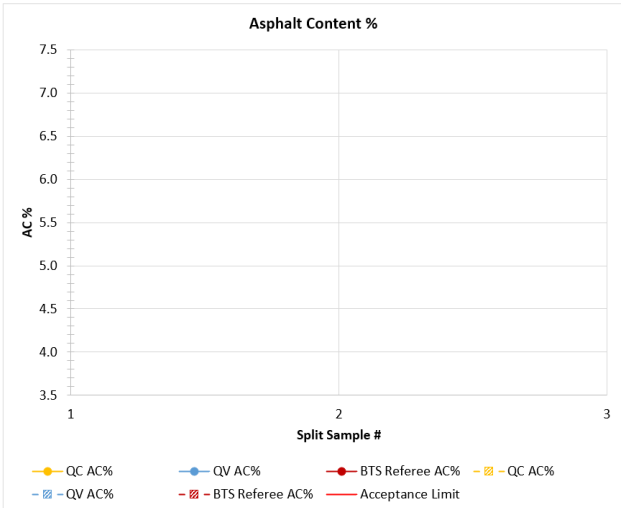
This worksheet only appears when either “Combined Density and Volumetrics” or “Volumetric-Only” is selected as the Test Strip Type on the *Project Info & Instruction* worksheet. The correct version of this worksheet will appear for either HMA or SMA based on the Mix Type entered on the *Project Info & Instruction* worksheet. This worksheet is used to enter the results of the asphalt content testing.

The Department Representative will enter the following information from the asphalt content testing (Figure 11):

- QC AC%
- QV AC%
- BTS Referee AC% (if required)

|  <b>HMA Asphalt Content Testing</b><br>Wisconsin Department of Transportation                                                                                                                   |         |                                |        |                    |                 |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|--------------------------------|--------|--------------------|-----------------|
| Date: _____                                                                                                                                                                                                                                                                      |         | Test Strip #: _____            |        |                    |                 |
| Project ID: _____                                                                                                                                                                                                                                                                |         | Route/Road: _____              |        |                    |                 |
| Mix Type: _____                                                                                                                                                                                                                                                                  |         | Layer: _____                   |        |                    |                 |
|                                                                                                                                                                                                                                                                                  |         | JMF AC%: Enter JMF Binder AC%. |        |                    |                 |
| <b>Measured Asphalt Content (%)</b>                                                                                                                                                                                                                                              |         |                                |        |                    |                 |
| Split Sample Number                                                                                                                                                                                                                                                              | Tonnage | QC AC%                         | QV AC% | Difference QC & QV | BTS Referee AC% |
| 1                                                                                                                                                                                                                                                                                |         |                                |        |                    |                 |
| 2                                                                                                                                                                                                                                                                                |         |                                |        |                    |                 |
| 3                                                                                                                                                                                                                                                                                |         |                                |        |                    |                 |
| Note: The AC% values below are calculated using the JMF Gse, JMF AC Specific Gravity, and each Split Sample's Gmm.                                                                                                                                                               |         |                                |        |                    |                 |
| <b>Calculated Asphalt Content (%)</b>                                                                                                                                                                                                                                            |         |                                |        |                    |                 |
| Split Sample Number                                                                                                                                                                                                                                                              | Tonnage | QC AC%                         | QV AC% | Difference QC & QV | BTS Referee AC% |
| 1                                                                                                                                                                                                                                                                                |         |                                |        |                    |                 |
| 2                                                                                                                                                                                                                                                                                |         |                                |        |                    |                 |
| 3                                                                                                                                                                                                                                                                                |         |                                |        |                    |                 |
| Enter the JMF Gse and AC Sp. Gr. on Project Info & Instructions Tab.                                                                                                                                                                                                             |         |                                |        |                    |                 |
| <b>Note:</b><br>Enter JMF AC %, JMF Gse, and JMF AC Specific Gravity on the <i>Project Info &amp; Instructions</i> tab. No pay adjustment will be assessed based on AC % test results. However, results of AC % testing will be referenced when determining test strip approval. |         |                                |        |                    |                 |

**Asphalt Content %**



Split Sample #

■ QC AC%      ● QV AC%      ◆ BTS Referee AC%      ■ QC AC%  
■ QV AC%      ■ BTS Referee AC%      — Acceptance Limit

Figure 11: HMA AC% Data Fields.

In the event referee testing is required due to unacceptable individual asphalt contents, the Split Sample Comparison fails, or there is unacceptable VMA, then the BTS Referee AC% cells will turn canary/yellow with red outlines. Enter the results of the BTS Referee Testing in the corresponding cells (Figure 12).

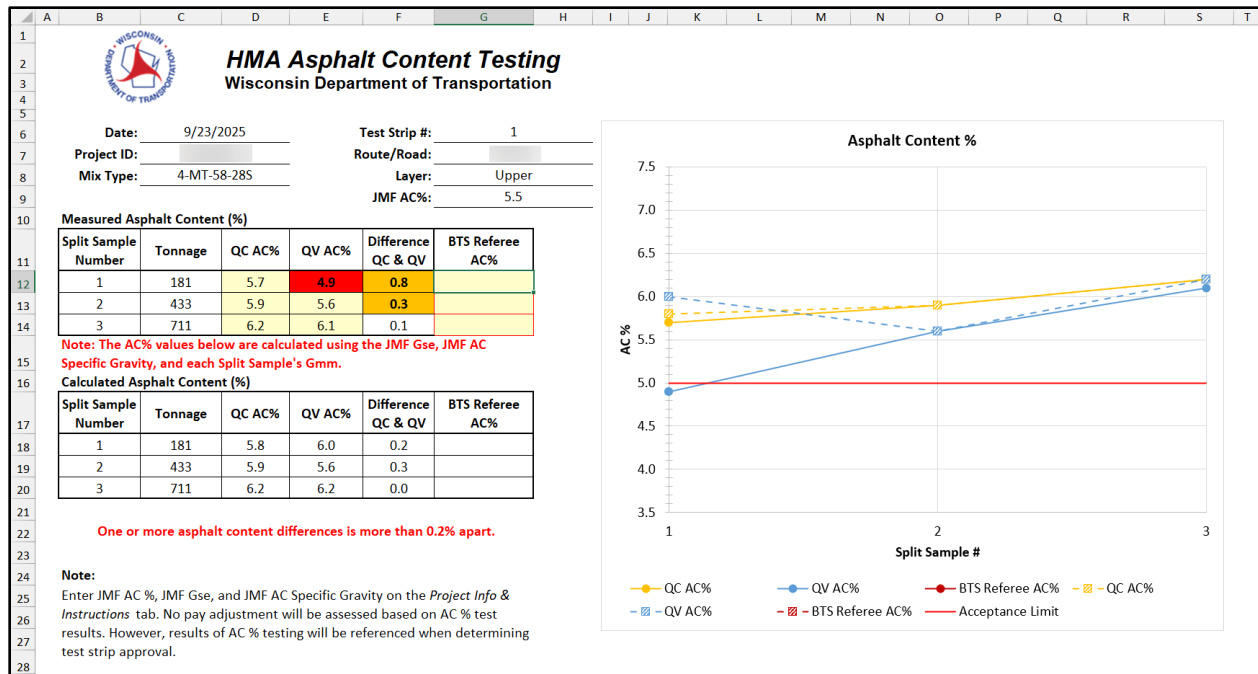


Figure 12: Individual Unacceptable Asphalt Contents.

Additionally, the table below the data entry table shows calculated asphalt contents that are calculated using each party's Gmm in the following equation:

$$\text{Calculated AC (\%)} = 100 * \frac{G_{AC,JMF}}{G_{mm,x}} * \frac{G_{se,JMF} - G_{mm,x}}{G_{se,JMF} - G_{AC,JMF}}$$

Where:

$G_{AC,JMF}$  = Asphalt Cement JMF Specific Gravity

$G_{se,JMF}$  = JMF Effective Stone Specific Gravity

$G_{mm,x}$  = Measured Gmm for Split Sample X (QC or QV)

Individually measured asphalt contents and calculated asphalted contents for both parties as well as the acceptance limits are drawn on the chart to the right of the data entry fields. Measured values are shown in solid-colored lines and markers, where QC values are yellow, QV values are blue, and BTS Referee values are Red. Calculated values for each party are also plotted using the same colors as measured values but using dashed lines and hashed markers instead.

## 8. Mix Acceptance

This worksheet only appears when either “Combined Density and Volumetrics” or “Volumetric-Only” is selected as the Test Strip Type on the *Project Info & Instruction* worksheet. The correct version of this worksheet will appear for either HMA or SMA based on the Mix Type entered on the *Project Info & Instruction* worksheet. This worksheet is used to accept the mixture’s split sample gradations and VMAs.

The Department Representative will check the box for each measured property that meets the acceptance limits for each split sample (Figure 13). VMA will be automatically be calculated and shown for each party’s split sample as the required parameters for calculation are entered into the worksheet.

|    | A                                                                                                                                                                                                                                                                                                                                                                          | B | C | D | E | F                                                                                          | G                        | H                        | I |  |
|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|---|---|--------------------------------------------------------------------------------------------|--------------------------|--------------------------|---|--|
| 1  |  <b>HMA Mix Acceptance Results</b><br><b>Wisconsin Department of Transportation</b>                                                                                                                                                                                                       |   |   |   |   |                                                                                            |                          |                          |   |  |
| 2  |                                                                                                                                                                                                                                                                                                                                                                            |   |   |   |   |                                                                                            |                          |                          |   |  |
| 3  |                                                                                                                                                                                                                                                                                                                                                                            |   |   |   |   |                                                                                            |                          |                          |   |  |
| 4  |                                                                                                                                                                                                                                                                                                                                                                            |   |   |   |   |                                                                                            |                          |                          |   |  |
| 5  |                                                                                                                                                                                                                                                                                                                                                                            |   |   |   |   |                                                                                            |                          |                          |   |  |
| 6  | Test Strip HMA mixture shall conform to the following acceptance limits based on individual QC and QV test results (tolerances based on most recent JMF). Gradation acceptance limits only apply to applicable mixture design control sieves defined in Standard Spec 460 Table 460-1. Confirm that the mixture conforms to acceptance limits by checking the boxes below. |   |   |   |   |                                                                                            |                          |                          |   |  |
| 7  |                                                                                                                                                                                                                                                                                                                                                                            |   |   |   |   |                                                                                            |                          |                          |   |  |
| 8  |                                                                                                                                                                                                                                                                                                                                                                            |   |   |   |   |                                                                                            |                          |                          |   |  |
| 9  |                                                                                                                                                                                                                                                                                                                                                                            |   |   |   |   |                                                                                            |                          |                          |   |  |
| 10 |                                                                                                                                                                                                                                                                                                                                                                            |   |   |   |   |                                                                                            |                          |                          |   |  |
| 11 |                                                                                                                                                                                                                                                                                                                                                                            |   |   |   |   | <b>Split Sample</b>                                                                        |                          |                          |   |  |
| 12 |                                                                                                                                                                                                                                                                                                                                                                            |   |   |   |   | 1                                                                                          | 2                        | 3                        |   |  |
| 13 |                                                                                                                                                                                                                                                                                                                                                                            |   |   |   |   | <b>Check All</b>                                                                           | <b>Check All</b>         | <b>Check All</b>         |   |  |
| 14 |                                                                                                                                                                                                                                                                                                                                                                            |   |   |   |   | <input type="checkbox"/>                                                                   | <input type="checkbox"/> | <input type="checkbox"/> |   |  |
| 15 |                                                                                                                                                                                                                                                                                                                                                                            |   |   |   |   | <input type="checkbox"/>                                                                   | <input type="checkbox"/> | <input type="checkbox"/> |   |  |
| 16 |                                                                                                                                                                                                                                                                                                                                                                            |   |   |   |   | <input type="checkbox"/>                                                                   | <input type="checkbox"/> | <input type="checkbox"/> |   |  |
| 17 |                                                                                                                                                                                                                                                                                                                                                                            |   |   |   |   | <input type="checkbox"/>                                                                   | <input type="checkbox"/> | <input type="checkbox"/> |   |  |
| 18 |                                                                                                                                                                                                                                                                                                                                                                            |   |   |   |   | <input type="checkbox"/>                                                                   | <input type="checkbox"/> | <input type="checkbox"/> |   |  |
| 19 |                                                                                                                                                                                                                                                                                                                                                                            |   |   |   |   | <input type="checkbox"/>                                                                   | <input type="checkbox"/> | <input type="checkbox"/> |   |  |
| 20 |                                                                                                                                                                                                                                                                                                                                                                            |   |   |   |   | <input type="checkbox"/>                                                                   | <input type="checkbox"/> | <input type="checkbox"/> |   |  |
| 21 |                                                                                                                                                                                                                                                                                                                                                                            |   |   |   |   | <input type="checkbox"/>                                                                   | <input type="checkbox"/> | <input type="checkbox"/> |   |  |
| 22 |                                                                                                                                                                                                                                                                                                                                                                            |   |   |   |   | QC:                                                                                        |                          |                          |   |  |
| 23 |                                                                                                                                                                                                                                                                                                                                                                            |   |   |   |   | QV:                                                                                        |                          |                          |   |  |
| 24 |                                                                                                                                                                                                                                                                                                                                                                            |   |   |   |   | BTS:                                                                                       |                          |                          |   |  |
| 25 |                                                                                                                                                                                                                                                                                                                                                                            |   |   |   |   |                                                                                            |                          |                          |   |  |
| 26 |                                                                                                                                                                                                                                                                                                                                                                            |   |   |   |   | <b>Gradation Result:</b>                                                                   |                          |                          |   |  |
| 27 |                                                                                                                                                                                                                                                                                                                                                                            |   |   |   |   | <b>VMA Result:</b>                                                                         |                          |                          |   |  |
| 28 |                                                                                                                                                                                                                                                                                                                                                                            |   |   |   |   |                                                                                            |                          |                          |   |  |
| 29 |                                                                                                                                                                                                                                                                                                                                                                            |   |   |   |   |                                                                                            |                          |                          |   |  |
| 30 |                                                                                                                                                                                                                                                                                                                                                                            |   |   |   |   |                                                                                            |                          |                          |   |  |
| 31 |                                                                                                                                                                                                                                                                                                                                                                            |   |   |   |   | <div style="border: 1px solid black; padding: 5px; display: inline-block;">Clear All</div> |                          |                          |   |  |

Figure 13: Mix Acceptance Checklist

Notes:

- The checklist applies to QC and QV/BTS results. If any party does not meet the acceptance limit for a property in the list, the checkbox should not be marked.
  - QV/BTS may optionally test the gradation.

If either the split sample comparison, asphalt contents, or VMA require BTS referee testing, the VMA Result will be flagged with “BTS”. Otherwise, if any of the requirements are not met, the split sample not meeting the requirement will be flagged with “Fail”, otherwise it will be flagged with “Pass” (Figure 14).

|    | A | B                                                                                 | C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | D                 | E | F                                   | G                                   | H                                   | I    |
|----|---|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|---|-------------------------------------|-------------------------------------|-------------------------------------|------|
| 1  |   |  | <h2 style="text-align: center;">HMA Mix Acceptance Results</h2> <h3 style="text-align: center;">Wisconsin Department of Transportation</h3> <p>Test Strip HMA mixture shall conform to the following acceptance limits based on individual QC and QV test results (tolerances based on most recent JMF). Gradation acceptance limits only apply to applicable mixture design control sieves defined in Standard Spec 460 Table 460-1. Confirm that the mixture conforms to acceptance limits by checking the boxes below.</p> |                   |   |                                     |                                     |                                     |      |
| 2  |   |                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                   |   |                                     |                                     |                                     |      |
| 3  |   |                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                   |   |                                     |                                     |                                     |      |
| 4  |   |                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                   |   |                                     |                                     |                                     |      |
| 5  |   |                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                   |   |                                     |                                     |                                     |      |
| 6  |   |                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                   |   |                                     |                                     |                                     |      |
| 7  |   |                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                   |   |                                     |                                     |                                     |      |
| 8  |   |                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                   |   |                                     |                                     |                                     |      |
| 9  |   |                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                   |   |                                     |                                     |                                     |      |
| 10 |   |                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                   |   |                                     |                                     |                                     |      |
| 11 |   |                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                   |   | Split Sample                        |                                     |                                     |      |
| 12 |   |                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                   |   | 1                                   | 2                                   | 3                                   |      |
| 13 |   |                                                                                   | Item                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Acceptance Limits |   | Check All                           | Check All                           | Check All                           |      |
| 14 |   |                                                                                   | 37.5-mm (1 1/2-inch)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | +/- 8.0           |   | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |      |
| 15 |   |                                                                                   | 25.0-mm (1-inch)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | +/- 8.0           |   | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |      |
| 16 |   |                                                                                   | 19.0-mm (3/4-inch)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | +/- 7.5           |   | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |      |
| 17 |   |                                                                                   | 12.5-mm (1/2-inch)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | +/- 7.5           |   | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |      |
| 18 |   |                                                                                   | 9.5-mm (3/8-inch)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | +/- 7.5           |   | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |      |
| 19 |   |                                                                                   | 4.75-mm (No. 4)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | +/- 7.0           |   | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |      |
| 20 |   |                                                                                   | 2.36-mm (No. 8)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | +/- 7.0           |   | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |      |
| 21 |   |                                                                                   | 1.18-mm (No. 16)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | +/- 4.0           |   | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |      |
| 22 |   |                                                                                   | 75-µm (No. 200)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | +/- 3.0           |   | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |      |
| 23 |   |                                                                                   | VMA in Percent <sup>[1]</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | -1.0              |   | QC: 15.4                            | 15.5                                | 15.6                                |      |
| 24 |   |                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                   |   | QV: 15.2                            | 15.3                                | 15.3                                |      |
| 25 |   |                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                   |   | BTS:                                |                                     |                                     |      |
| 26 |   |                                                                                   | <sup>[1]</sup> VMA limits based on minimum requirement for mix design nominal maximum aggregate size in table 460-1.                                                                                                                                                                                                                                                                                                                                                                                                          |                   |   | Gradation Result:                   | PASS                                | FAIL                                | PASS |
| 27 |   |                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                   |   | VMA Result:                         | PASS                                | PASS                                | PASS |
| 28 |   |                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                   |   |                                     |                                     |                                     |      |
| 29 |   |                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                   |   |                                     |                                     |                                     |      |
| 30 |   |                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                   |   |                                     |                                     |                                     |      |
| 31 |   |                                                                                   | <div style="border: 1px solid black; padding: 5px; display: inline-block;">Clear All</div>                                                                                                                                                                                                                                                                                                                                                                                                                                    |                   |   |                                     |                                     |                                     |      |

Figure 14: Passing/Failing Mixture Properties.

There are several buttons for worksheet functions found above each split sample and below the results of the analysis. The buttons perform the following functions:

|                                                                                   |                                                                                                                             |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
|  | <ul style="list-style-type: none"> <li>• Checks all properties as passing for the split sample below the button.</li> </ul> |
|  | <ul style="list-style-type: none"> <li>• Clears all checkboxes (Resets the worksheet).</li> </ul>                           |

## 9. Air Voids Pay Factor

This worksheet only appears when either “Combined Density and Volumetrics” or “Volumetric-Only” is selected as the Test Strip Type on the *Project Info & Instruction* worksheet. The correct version of this worksheet will appear for either HMA or SMA based on the Mix Type entered on the *Project Info & Instruction* worksheet. This worksheet is used to review the test strip’s air voids results and the associated pay adjustments (Figure 15 and Figure 16).

No information is to be entered into this worksheet.

Depending on the results of the t- and Xd Mean testing performed on the *Split Sample Comparison* worksheet, the QC or BTS test results will be used to calculate the air voids used to calculate the  $PWL_{VA}$  and Air Voids Pay Adjustment. Additionally, that party’s Gmm values will be used to calculate the Average Gmm (HMA: cell D16; SMA: cell D17) used to calculate the Target Max Density (PCF) for the density portion of the test strip. The party whose results are used for the analysis is identified by the Gmm Source (HMA: cell D17, SMA: cell D18).

| HMA Air Voids Pay Factor<br>Wisconsin Department of Transportation |              |               |     |                        |           |                    |      |                         |                   |                  |                 |                          |
|--------------------------------------------------------------------|--------------|---------------|-----|------------------------|-----------|--------------------|------|-------------------------|-------------------|------------------|-----------------|--------------------------|
| Date:                                                              |              | Test Strip #: |     | LSL <sub>va</sub> :    |           | 2.0                |      | PWL Default Unit Price: |                   | \$65.00          |                 |                          |
| Project ID:                                                        |              | Route/Road:   |     | Target <sub>va</sub> : |           | 3.0                |      | Contract Unit Price:    |                   |                  |                 |                          |
| Mix Type: --                                                       |              | Layer:        |     | USL <sub>va</sub> :    |           | 4.3                |      |                         |                   |                  |                 |                          |
| Air Voids                                                          |              |               |     |                        |           |                    |      |                         |                   |                  |                 |                          |
| Lot                                                                | Split Sample | Date          | Gmm | Gmb                    | Air Voids | Standard Deviation | Mean | Number of Tests in Lot  | PWL <sub>va</sub> | PF <sub>va</sub> | Lot Size (Tons) | Air Voids Pay Adjustment |
| TS-                                                                | 1            |               |     |                        |           |                    |      | 3                       |                   |                  |                 |                          |
|                                                                    | 2            |               |     |                        |           |                    |      |                         |                   |                  |                 |                          |
|                                                                    | 3            |               |     |                        |           |                    |      |                         |                   |                  |                 |                          |
| Average Gmm:                                                       |              |               |     |                        |           |                    |      |                         |                   |                  |                 |                          |
| Gmm Source:                                                        |              |               | QC  |                        |           |                    |      |                         |                   |                  |                 |                          |

Figure 15: HMA Air Voids Pay Adjustment Interface.

| SMA Air Voids Pay Factor<br>Wisconsin Department of Transportation |              |               |     |                        |           |               |     |                      |                                             |                                          |                                           |                          |
|--------------------------------------------------------------------|--------------|---------------|-----|------------------------|-----------|---------------|-----|----------------------|---------------------------------------------|------------------------------------------|-------------------------------------------|--------------------------|
| Date:                                                              |              | Test Strip #: |     | LSL <sub>va</sub> :    |           | 3.2           |     | Contract Unit Price: |                                             |                                          |                                           |                          |
| Project ID:                                                        |              | Route/Road:   |     | Target <sub>va</sub> : |           | 4.5           |     |                      |                                             |                                          |                                           |                          |
| Mix Type: --                                                       |              | Layer:        |     | USL <sub>va</sub> :    |           | 5.8           |     |                      |                                             |                                          |                                           |                          |
| Air Voids                                                          |              |               |     |                        |           | BTS Air Voids |     |                      | Pay Adjustment                              |                                          |                                           |                          |
| Lot                                                                | Split Sample | Date          | Gmm | Gmb                    | Air Voids | Gmm           | Gmb | Air Voids            | Nonconforming / Unacceptable Tonnage (Tons) | Nonconforming / Unacceptable Pay Factors | Tonnage Eligible For Full 100% Pay (Tons) | Air Voids Pay Adjustment |
| TS-                                                                | QC-1         | 1/0/1900      |     |                        |           |               |     |                      | 0.00                                        | N/A                                      | 0.00                                      |                          |
|                                                                    | QC-2         |               |     |                        |           |               |     | 0.00                 | N/A                                         |                                          |                                           |                          |
|                                                                    | QV-1         |               |     |                        |           |               |     |                      |                                             |                                          |                                           |                          |
|                                                                    | QV-2         |               |     |                        |           |               |     |                      |                                             |                                          |                                           |                          |
| Average Gmm:                                                       |              |               |     |                        |           |               |     |                      |                                             |                                          |                                           |                          |
| Gmm Source:                                                        |              |               | QC  |                        |           |               |     |                      |                                             |                                          |                                           |                          |

Figure 16: SMA Air Voids Pay Adjustment Interface.

## 10. Density Pay Factor

This worksheet only appears when either “Combined Density and Volumetrics” or “Density-Only” is selected as the Test Strip Type on the *Project Info & Instruction* worksheet. The correct version of this worksheet will appear for either HMA or SMA based on the Mix Type entered on the *Project Info & Instruction* worksheet. This worksheet is used to review the test strip’s density results and the associated pay adjustments (Figure 17).

No information is to be entered into this worksheet.

Notes:

- For a Combined Volumetric and Density Test Strip, depending on the results of the split sample comparison testing, the QC or BTS test results will be used for the Average Gmm (cell D23) for the Target Max Density (PCF) of the cores and nuclear gauge readings.
- For a Density-Only Test Strip, the Daily Average Gmm (cell D52 in *Project Info & Instructions*), will be used as the Average Gmm (cell D23) to calculate density.
- The Gmm source is identified in cell D24.
- The Department Representative will determine which party’s core density results will be used for acceptance, pay adjustment, and nuclear gauge correlation on the *Core Data* worksheet if verification testing is performed (otherwise the default is QC). The source of the data selected by the representative is identified in cell D25.

|  <b>HMA Density Pay Factor</b><br>Wisconsin Department of Transportation |          |               |                      |                    |      |                                 |                  |                 |                |                        |  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|---------------|----------------------|--------------------|------|---------------------------------|------------------|-----------------|----------------|------------------------|--|
| Date:                                                                                                                                                       |          | Test Strip #: |                      | LSL(%): 93.0       |      | PWL Default Unit Price: \$65.00 |                  |                 |                |                        |  |
| Project ID:                                                                                                                                                 |          | Route/Road:   |                      |                    |      | Contract Unit Price:            |                  |                 |                |                        |  |
| Mix Type: --                                                                                                                                                |          | Layer:        |                      |                    |      |                                 |                  |                 |                |                        |  |
| Density                                                                                                                                                     |          |               |                      |                    |      |                                 |                  |                 |                |                        |  |
| Zone                                                                                                                                                        | Core No. | Date          | Core Density (% Gmm) | Standard Deviation | Mean | Number of Tests in Lot          | PWL <sub>D</sub> | PF <sub>D</sub> | Lot Size (Ton) | Density Pay Adjustment |  |
| 1                                                                                                                                                           |          |               |                      |                    |      | 0                               |                  |                 |                |                        |  |
|                                                                                                                                                             |          |               |                      |                    |      |                                 |                  |                 |                |                        |  |
|                                                                                                                                                             |          |               |                      |                    |      |                                 |                  |                 |                |                        |  |
|                                                                                                                                                             |          |               |                      |                    |      |                                 |                  |                 |                |                        |  |
|                                                                                                                                                             |          |               |                      |                    |      |                                 |                  |                 |                |                        |  |
| 2                                                                                                                                                           |          |               |                      |                    |      |                                 |                  |                 |                |                        |  |
|                                                                                                                                                             |          |               |                      |                    |      |                                 |                  |                 |                |                        |  |
|                                                                                                                                                             |          |               |                      |                    |      |                                 |                  |                 |                |                        |  |
|                                                                                                                                                             |          |               |                      |                    |      |                                 |                  |                 |                |                        |  |
|                                                                                                                                                             |          |               |                      |                    |      |                                 |                  |                 |                |                        |  |
| Average Gmm: _____<br>Gmm Source: _____ QC<br>Core Density Source: _____ QC                                                                                 |          |               |                      |                    |      |                                 |                  |                 |                |                        |  |

Figure 17: HMA Density Pay Adjustment Interface.

|    | A                                                                                                                                                         | B        | C    | D                                  | E                       | F          | G                                                        | H              | I                      | J | K |
|----|-----------------------------------------------------------------------------------------------------------------------------------------------------------|----------|------|------------------------------------|-------------------------|------------|----------------------------------------------------------|----------------|------------------------|---|---|
| 1  |  <b>SMA Density Pay Factor</b><br>Wisconsin Department of Transportation |          |      |                                    |                         |            |                                                          |                |                        |   |   |
| 2  |                                                                                                                                                           |          |      |                                    |                         |            |                                                          |                |                        |   |   |
| 3  |                                                                                                                                                           |          |      |                                    |                         |            |                                                          |                |                        |   |   |
| 4  |                                                                                                                                                           |          |      |                                    |                         |            |                                                          |                |                        |   |   |
| 5  |                                                                                                                                                           |          |      |                                    |                         |            |                                                          |                |                        |   |   |
| 6  | Date: <input type="text"/>                                                                                                                                |          |      | Test Strip #: <input type="text"/> |                         |            | LSL(%): <input type="text" value="93.0"/>                |                |                        |   |   |
| 7  | Project ID: <input type="text"/>                                                                                                                          |          |      | Route/Road: <input type="text"/>   |                         |            | Contract Unit Price: <input type="text" value="\$0.00"/> |                |                        |   |   |
| 8  | Mix Type: <input type="text" value="--"/>                                                                                                                 |          |      | Layer: <input type="text"/>        |                         |            |                                                          |                |                        |   |   |
| 9  |                                                                                                                                                           |          |      |                                    |                         |            |                                                          |                |                        |   |   |
| 10 | Density                                                                                                                                                   |          |      |                                    |                         |            |                                                          |                |                        |   |   |
| 11 | Zone                                                                                                                                                      | Core No. | Date | Core Density<br>(% Gmm)            | Average Core<br>Density | Pay Factor | Pay Adjustment / Ton                                     | Lot Size (Ton) | Density Pay Adjustment |   |   |
| 12 | 1                                                                                                                                                         |          |      |                                    |                         |            |                                                          |                |                        |   |   |
| 13 |                                                                                                                                                           |          |      |                                    |                         |            |                                                          |                |                        |   |   |
| 14 |                                                                                                                                                           |          |      |                                    |                         |            |                                                          |                |                        |   |   |
| 15 |                                                                                                                                                           |          |      |                                    |                         |            |                                                          |                |                        |   |   |
| 16 |                                                                                                                                                           |          |      |                                    |                         |            |                                                          |                |                        |   |   |
| 17 | 2                                                                                                                                                         |          |      |                                    |                         |            |                                                          |                |                        |   |   |
| 18 |                                                                                                                                                           |          |      |                                    |                         |            |                                                          |                |                        |   |   |
| 19 |                                                                                                                                                           |          |      |                                    |                         |            |                                                          |                |                        |   |   |
| 20 |                                                                                                                                                           |          |      |                                    |                         |            |                                                          |                |                        |   |   |
| 21 |                                                                                                                                                           |          |      |                                    |                         |            |                                                          |                |                        |   |   |
| 22 |                                                                                                                                                           |          |      |                                    |                         |            |                                                          |                |                        |   |   |
| 23 | Gmm Used for Core Density: <input type="text"/>                                                                                                           |          |      |                                    |                         |            |                                                          |                |                        |   |   |
| 24 | Gmm Data Used: <input type="text" value="QC"/>                                                                                                            |          |      |                                    |                         |            |                                                          |                |                        |   |   |
| 25 | Core Data Used: <input type="text" value="QC"/>                                                                                                           |          |      |                                    |                         |            |                                                          |                |                        |   |   |
| 26 |                                                                                                                                                           |          |      |                                    |                         |            |                                                          |                |                        |   |   |

Figure 18: SMA Density Pay Factor Interface.



## 11. Test Strip Summary

This worksheet is used to display the acceptance results of the Test Strip as well as the Nuclear Density Gauge Correlation, if performed (Figure 19 and Figure 20). The Nuclear Density Gauge Correlation will only appear when either “Combined Density and Volumetrics” or “Density-Only” is selected as the Test Strip Type on the *Project Info & Instruction* worksheet.

“Volumetric-Only” test strips will hide all density portions on the *Test Strip Summary* and “Density-Only” test strips will hide all volumetric portions of the *Test Strip Summary*. The correct version of this worksheet will appear for either HMA or SMA based on the Mix Type entered on the *Project Info & Instruction* worksheet.

Each portion of the test strip is broken down into the various acceptance requirements:

- Volumetrics
  - Split Sample Comparison
    - Gmm/Gmb t-test comparison (HMA only).
    - Gmm within tolerance of JMF (HMA only).
    - Test differences (Xd) between parties are within tolerance.
  - Air Voids
    - PWL (HMA only).
  - Asphalt Content
  - Gradation and VMA
- Density
  - PWL (HMA only)
  - Average (SMA only)

Any agreed upon resolutions to any issues that occurred during the test strip should be entered in the Resolutions space at the bottom of this worksheet. Examples of resolutions include, but are not limited to:

- Test Strip left in place but required the construction of another test strip prior to continuing to production.
- Test Strip removed and replaced.
- Contractor will make an adjustment to some process to bring some parameter back into acceptable limits.
- Contractor will reheat mixture during production to account for testing differences between parties.
- Etc.

This worksheet will decide based on the results of the test strip whether the material is acceptable, nonconforming, or unacceptable. It also determines the following outcomes of the test strip:

- Approved, proceed with production.
- Approved; However, consult Regional PWL Rep. & BTS prior to proceeding with production.

- Not Approved. Consult Regional PWL Representative & BTS to determine need for an additional test strip.
- Not Approved. Construct an additional Volumetric and/or Density Test Strip

| HMA Test Strip Summary                              |                 | Wisconsin Department of Transportation       |                 |                  |                  |                            |                      |              |
|-----------------------------------------------------|-----------------|----------------------------------------------|-----------------|------------------|------------------|----------------------------|----------------------|--------------|
| Contract ID: <input type="text"/>                   |                 | Test Strip #: <input type="text"/>           |                 |                  |                  |                            |                      |              |
| Project ID: <input type="text"/>                    |                 | Route/Road: <input type="text"/>             |                 |                  |                  |                            |                      |              |
| WisDOT Mix Design ID: <input type="text"/>          |                 | Paving Width (ft): <input type="text"/>      |                 |                  |                  |                            |                      |              |
| Mix Type: <input type="text"/>                      |                 | Lane Width (ft): <input type="text"/>        |                 |                  |                  |                            |                      |              |
|                                                     |                 | Nominal Thickness (in): <input type="text"/> |                 |                  |                  |                            |                      |              |
|                                                     |                 | Contract Unit Price: <input type="text"/>    |                 |                  |                  |                            |                      |              |
|                                                     |                 | Test Strip Type: <input type="text"/>        |                 |                  |                  |                            |                      |              |
| Overall Test Strip Approval and Material Acceptance |                 |                                              |                 |                  |                  |                            |                      |              |
| Test Strip: <input type="text"/>                    |                 |                                              |                 |                  |                  |                            |                      |              |
| Material: <input type="text"/>                      |                 |                                              |                 |                  |                  |                            |                      |              |
| Volumetrics                                         |                 |                                              |                 |                  |                  |                            |                      |              |
| Split Sample Comparison                             |                 |                                              |                 |                  |                  |                            |                      |              |
| Gmm Split Sample t-test Results:                    |                 |                                              |                 |                  |                  |                            |                      |              |
| Gmm Average Differences (Kd Mean) Within Tolerance? |                 |                                              |                 |                  |                  |                            |                      |              |
| All Gmms within JMF Acceptance Limit?               |                 |                                              |                 |                  |                  |                            |                      |              |
| Gmb Split Sample t-test Results:                    |                 |                                              |                 |                  |                  |                            |                      |              |
| Gmb Average Differences (Kd Mean) Within Tolerance? |                 |                                              |                 |                  |                  |                            |                      |              |
| Split Sample Comparison Conclusion:                 |                 |                                              |                 |                  |                  |                            |                      |              |
| Air Voids                                           |                 |                                              |                 |                  |                  |                            |                      |              |
| Air Voids Test Strip Tonnage:                       |                 |                                              |                 |                  |                  |                            |                      |              |
| PWL:                                                |                 |                                              |                 |                  |                  |                            |                      |              |
| Pay Factor:                                         |                 |                                              |                 |                  |                  |                            |                      |              |
| Air Voids Net Pay Adjustment:                       |                 |                                              |                 |                  |                  |                            |                      |              |
| Air Voids Conclusion:                               |                 |                                              |                 |                  |                  |                            |                      |              |
| Asphalt Content                                     |                 |                                              |                 |                  |                  |                            |                      |              |
| Asphalt Content Conclusion:                         |                 |                                              |                 |                  |                  |                            |                      |              |
| Gradation and VMA                                   |                 |                                              |                 |                  |                  |                            |                      |              |
| Gradation Conclusion:                               |                 |                                              |                 |                  |                  |                            |                      |              |
| VMA Conclusion:                                     |                 |                                              |                 |                  |                  |                            |                      |              |
| Density                                             |                 |                                              |                 |                  |                  |                            |                      |              |
| Density Test Strip Tonnage:                         |                 |                                              |                 |                  |                  |                            |                      |              |
| PWL:                                                |                 |                                              |                 |                  |                  |                            |                      |              |
| Pay Factor:                                         |                 |                                              |                 |                  |                  |                            |                      |              |
| Density Net Pay Adjustment:                         |                 |                                              |                 |                  |                  |                            |                      |              |
| Density Conclusion:                                 |                 |                                              |                 |                  |                  |                            |                      |              |
| Nuclear Density Gauge Correlation                   |                 |                                              |                 |                  |                  |                            |                      |              |
| Gauge ID                                            | Technician      | Gauge Serial #                               | Core Spread (%) | Gauge Spread (%) | Gauge Comp. Avg. | Correlation R <sup>2</sup> | Gauge Recommendation | Gauge Offset |
| QC-1                                                | Enter Tech Info | Enter Serial #                               | 0.0             | 0.0              |                  |                            |                      |              |
| QC-2                                                | Enter Tech Info | Enter Serial #                               |                 | 0.0              |                  |                            |                      |              |
| QV-1                                                | Enter Tech Info | Enter Serial #                               |                 | 0.0              |                  |                            |                      |              |
| QV-2                                                | Enter Tech Info | Enter Serial #                               |                 | 0.0              |                  |                            |                      |              |
| Resolutions:                                        |                 |                                              |                 |                  |                  |                            |                      |              |

Figure 19: HMA Test Strip Summary Interface.

| SMA Test Strip Summary                                     |                 |                   |                 |                         |                  |                            |                      |              |  |
|------------------------------------------------------------|-----------------|-------------------|-----------------|-------------------------|------------------|----------------------------|----------------------|--------------|--|
| Wisconsin Department of Transportation                     |                 |                   |                 |                         |                  |                            |                      |              |  |
| Contract ID:                                               |                 | Test Strip #:     |                 | Paving Width (ft):      |                  |                            |                      |              |  |
| Project ID:                                                |                 | Route/Road:       |                 | Lane Width (ft):        |                  |                            |                      |              |  |
| WisDOT Mix Design ID:                                      |                 | Pavement Layer:   |                 | Nominal Thickness (in): |                  |                            |                      |              |  |
| Mix Type:                                                  |                 | Underlying Layer: |                 | Contract Unit Price:    |                  |                            |                      |              |  |
|                                                            |                 | Test Strip Type:  |                 | Volumetrics and Density |                  |                            |                      |              |  |
| <b>Overall Test Strip Approval and Material Acceptance</b> |                 |                   |                 |                         |                  |                            |                      |              |  |
| Test Strip:                                                |                 |                   |                 |                         |                  |                            |                      |              |  |
| Material:                                                  |                 |                   |                 |                         |                  |                            |                      |              |  |
| <b>Volumetrics</b>                                         |                 |                   |                 |                         |                  |                            |                      |              |  |
| <b>Split Sample Comparison</b>                             |                 |                   |                 |                         |                  |                            |                      |              |  |
| Gmm Differences Within Tolerance?                          |                 |                   |                 |                         |                  |                            |                      |              |  |
| Gmb Differences Within Tolerance?                          |                 |                   |                 |                         |                  |                            |                      |              |  |
| Split Sample Comparison Conclusion:                        |                 |                   |                 |                         |                  |                            |                      |              |  |
| <b>Air Voids</b>                                           |                 |                   |                 |                         |                  |                            |                      |              |  |
| Air Voids Test Strip Tonnage:                              |                 |                   |                 |                         |                  |                            |                      |              |  |
| Nonconforming / Unacceptable Tonnage:                      |                 |                   |                 |                         |                  |                            |                      |              |  |
| Air Voids Net Pay Adjustment:                              |                 |                   |                 |                         |                  |                            |                      |              |  |
| Air Voids Conclusion:                                      |                 |                   |                 |                         |                  |                            |                      |              |  |
| <b>Asphalt Content</b>                                     |                 |                   |                 |                         |                  |                            |                      |              |  |
| Asphalt Content Conclusion:                                |                 |                   |                 |                         |                  |                            |                      |              |  |
| <b>Gradation and VMA</b>                                   |                 |                   |                 |                         |                  |                            |                      |              |  |
| Gradation Conclusion:                                      |                 |                   |                 |                         |                  |                            |                      |              |  |
| VMA Conclusion:                                            |                 |                   |                 |                         |                  |                            |                      |              |  |
| <b>Density</b>                                             |                 |                   |                 |                         |                  |                            |                      |              |  |
| Density Test Strip Tonnage:                                |                 |                   |                 |                         |                  |                            |                      |              |  |
| Density Net Pay Adjustment:                                |                 |                   |                 |                         |                  |                            |                      |              |  |
| Average Core Density (%):                                  |                 |                   |                 |                         |                  |                            |                      |              |  |
| Density Conclusion:                                        |                 |                   |                 |                         |                  |                            |                      |              |  |
| <b>Nuclear Density Gauge Correlation</b>                   |                 |                   |                 |                         |                  |                            |                      |              |  |
| Gauge ID                                                   | Technician      | Gauge Serial #    | Core Spread (%) | Gauge Spread (%)        | Gauge Comp. Avg. | Correlation R <sup>2</sup> | Gauge Recommendation | Gauge Offset |  |
| QC-1                                                       | Enter Tech info | Enter Serial #    | 0.0             | 0.0                     |                  |                            |                      |              |  |
| QC-2                                                       | Enter Tech info | Enter Serial #    |                 | 0.0                     |                  |                            |                      |              |  |
| QV-1                                                       | Enter Tech info | Enter Serial #    |                 | 0.0                     |                  |                            |                      |              |  |
| QV-2                                                       | Enter Tech info | Enter Serial #    |                 | 0.0                     |                  |                            |                      |              |  |
| Resolutions:                                               |                 |                   |                 |                         |                  |                            |                      |              |  |

Figure 20: SMA Test Strip Summary Interface.

There are several buttons for worksheet functions found on the righthand side of the interface. The buttons perform the following functions:

|                                                                                               |                                                                                                                                                                                                                                                                                     |
|-----------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <div> Save with Automatic File Name<br/>and <u>Email to BTS</u><br/>(Outlook Required) </div> | <ul style="list-style-type: none"> <li>Saves the file using the automatic file name.</li> <li>After the file is saved, an email will be generated with the Excel file attached for submittal to BTS with pre-filled email fields. You may edit the email before sending.</li> </ul> |
|-----------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## 12. Gauge-Core Variability

This worksheet only appears when either “Combined Density and Volumetrics” or “Density-Only” is selected as the Test Strip Type on the *Project Info & Instruction* worksheet. This worksheet is used to review the Location Comparison Averages and the Gauge Comparison for nuclear gauge correlation portion of the test strip (Figure 21).

No information is to be entered into this worksheet.

The tables on the left half of the worksheet reflect the comparisons which may or may not have suspect cores removed from the analysis. The tables on the right half of the worksheet reflect the comparisons using all of the original data with no removed suspect cores.

Notes:

- The Location Comparison table is used to determine whether a core is deemed suspect. A core is deemed suspect when the Average of the Adjusted Differences (cells G12-G21) from all the gauges is either greater than or equal to 1.0 or less than or equal to -1.0 for a specific core. Suspect cores will be flagged in the table automatically with a red background Location Comparison Average and “Suspect Core” appearing in the third column (Figure 22). Cores deemed suspect may only be removed from the analysis by the Department Representative. Removing cores can be done in the *Core Data* worksheet. Refer to section 6 Core Data for additional information on removing cores (Figure 23).
- The Gauge Comparison table is used to determine whether a nuclear gauge is deemed suspect. A nuclear gauge is deemed suspect when the Average Absolute Adjusted Difference (Cells B36, C36, D36, and E36) for a particular gauge is greater than or equal to 1.0%. Suspect gauges will be flagged in the table automatically with a red background showing on the testing party, gauge ID, and Gauge Comparison Average (Figure 22). Gauges deemed suspect should be removed from the project and further diagnostics should be performed in coordination with the WisDOT Radiation Safety Officer.

| Gauge-Core Variability<br>Wisconsin Department of Transportation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                |                |                |                |                         |  |  |  |  |                               |                |      |      |      |                |                |                |                |                |  |  |  |  |  |  |  |  |  |  |  |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |  |  |  |  |  |  |  |  |         |           |                |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |  |  |  |  |  |  |  |  |         |           |               |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| Contract: _____                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                |                |                |                | Test Strip #: _____     |  |  |  |  | Paving Width (ft): _____      |                |      |      |      |                |                |                |                |                |  |  |  |  |  |  |  |  |  |  |  |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |  |  |  |  |  |  |  |  |         |           |                |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |  |  |  |  |  |  |  |  |         |           |               |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Job No./Project ID: _____                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                |                |                |                | Route/Road: _____       |  |  |  |  | Lane Width (ft): _____        |                |      |      |      |                |                |                |                |                |  |  |  |  |  |  |  |  |  |  |  |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |  |  |  |  |  |  |  |  |         |           |                |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |  |  |  |  |  |  |  |  |         |           |               |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| WisDOT Mix No.: _____                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                |                |                |                | Test Strip Layer: _____ |  |  |  |  | Nominal Thickness (in): _____ |                |      |      |      |                |                |                |                |                |  |  |  |  |  |  |  |  |  |  |  |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |  |  |  |  |  |  |  |  |         |           |                |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |  |  |  |  |  |  |  |  |         |           |               |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Mix Type: _____                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                |                |                |                | Underlying Layer: _____ |  |  |  |  | Contract Unit Price: _____    |                |      |      |      |                |                |                |                |                |  |  |  |  |  |  |  |  |  |  |  |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |  |  |  |  |  |  |  |  |         |           |                |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |  |  |  |  |  |  |  |  |         |           |               |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Core Data Used: _____                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                |                |                |                |                         |  |  |  |  |                               |                |      |      |      |                |                |                |                |                |  |  |  |  |  |  |  |  |  |  |  |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |  |  |  |  |  |  |  |  |         |           |                |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |  |  |  |  |  |  |  |  |         |           |               |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Nuclear Density Gauge Adjusted Difference                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                |                |                |                |                         |  |  |  |  | Location Comparison           |                |      |      |      |                |                |                |                |                |  |  |  |  |  |  |  |  |  |  |  |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |  |  |  |  |  |  |  |  |         |           |                |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |  |  |  |  |  |  |  |  |         |           |               |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| <table border="1"> <thead> <tr> <th>Core</th> <th>QC-1</th> <th>QC-2</th> <th>QV-1</th> <th>QV-2</th> </tr> <tr> <th>Enter Serial #</th> <th>Enter Serial #</th> <th>Enter Serial #</th> <th>Enter Serial #</th> <th>Enter Serial #</th> </tr> </thead> <tbody> <tr><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td></tr> </tbody> </table> |                |                |                |                |                         |  |  |  |  | Core                          | QC-1           | QC-2 | QV-1 | QV-2 | Enter Serial # | Enter Serial # | Enter Serial # | Enter Serial # | Enter Serial # |  |  |  |  |  |  |  |  |  |  |  |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |  |  |  |  |  |  |  |  |         |           |                |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | <table border="1"> <thead> <tr> <th>Average</th> <th>Std. Dev.</th> <th>Suspect Core?</th> </tr> </thead> <tbody> <tr><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td></tr> </tbody> </table> |  |  |  |  |  |  |  |  |  | Average | Std. Dev. | Suspect Core? |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Core                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | QC-1           | QC-2           | QV-1           | QV-2           |                         |  |  |  |  |                               |                |      |      |      |                |                |                |                |                |  |  |  |  |  |  |  |  |  |  |  |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |  |  |  |  |  |  |  |  |         |           |                |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |  |  |  |  |  |  |  |  |         |           |               |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Enter Serial #                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Enter Serial # | Enter Serial # | Enter Serial # | Enter Serial # |                         |  |  |  |  |                               |                |      |      |      |                |                |                |                |                |  |  |  |  |  |  |  |  |  |  |  |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |  |  |  |  |  |  |  |  |         |           |                |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |  |  |  |  |  |  |  |  |         |           |               |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| Core Absolute Value                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                |                |                |                |                         |  |  |  |  | Core Absolute Value           |                |      |      |      |                |                |                |                |                |  |  |  |  |  |  |  |  |  |  |  |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |  |  |  |  |  |  |  |  |         |           |                |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |  |  |  |  |  |  |  |  |         |           |               |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| Core                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Absolute Value |                |                |                |                         |  |  |  |  |                               |                |      |      |      |                |                |                |                |                |  |  |  |  |  |  |  |  |  |  |  |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |  |  |  |  |  |  |  |  |         |           |                |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |  |  |  |  |  |  |  |  |         |           |               |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| Average                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Std. Dev.      | Suspect Gauge? |                |                |                         |  |  |  |  |                               |                |      |      |      |                |                |                |                |                |  |  |  |  |  |  |  |  |  |  |  |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |  |  |  |  |  |  |  |  |         |           |                |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |  |  |  |  |  |  |  |  |         |           |               |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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Figure 21: Gauge-Core Variability Tables

| Gauge-Core Variability<br>Wisconsin Department of Transportation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                |                |                |                |                             |  |  |  |  |                              |                |      |      |      |                |                |                |                |                |      |     |      |     |      |      |      |     |      |     |       |      |                                                                                                                                                                                                                                                                                                                  |      |      |      |     |     |     |     |      |      |         |           |                |      |     |               |      |      |               |      |      |               |     |      |     |     |     |     |      |     |      |     |     |       |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |  |  |  |  |  |  |  |         |           |               |     |      |              |     |      |              |      |      |              |     |      |              |      |      |              |     |      |  |     |      |  |     |      |  |     |      |  |      |      |  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------------|----------------|----------------|-----------------------------|--|--|--|--|------------------------------|----------------|------|------|------|----------------|----------------|----------------|----------------|----------------|------|-----|------|-----|------|------|------|-----|------|-----|-------|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|------|-----|-----|-----|-----|------|------|---------|-----------|----------------|------|-----|---------------|------|------|---------------|------|------|---------------|-----|------|-----|-----|-----|-----|------|-----|------|-----|-----|-------|------|------|------|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|--|--|--|--|--|---------|-----------|---------------|-----|------|--------------|-----|------|--------------|------|------|--------------|-----|------|--------------|------|------|--------------|-----|------|--|-----|------|--|-----|------|--|-----|------|--|------|------|--|
| Contract: _____                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                |                |                |                | Test Strip #: 1             |  |  |  |  | Paving Width (ft): 17.0      |                |      |      |      |                |                |                |                |                |      |     |      |     |      |      |      |     |      |     |       |      |                                                                                                                                                                                                                                                                                                                  |      |      |      |     |     |     |     |      |      |         |           |                |      |     |               |      |      |               |      |      |               |     |      |     |     |     |     |      |     |      |     |     |       |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |  |  |  |  |  |  |  |         |           |               |     |      |              |     |      |              |      |      |              |     |      |              |      |      |              |     |      |  |     |      |  |     |      |  |     |      |  |      |      |  |
| Job No./Project ID: _____                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                |                |                |                | Route/Road: _____           |  |  |  |  | Lane Width (ft): 12.0        |                |      |      |      |                |                |                |                |                |      |     |      |     |      |      |      |     |      |     |       |      |                                                                                                                                                                                                                                                                                                                  |      |      |      |     |     |     |     |      |      |         |           |                |      |     |               |      |      |               |      |      |               |     |      |     |     |     |     |      |     |      |     |     |       |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |  |  |  |  |  |  |  |         |           |               |     |      |              |     |      |              |      |      |              |     |      |              |      |      |              |     |      |  |     |      |  |     |      |  |     |      |  |      |      |  |
| WisDOT Mix No.: 4-MT-58-285                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                |                |                |                | Test Strip Layer: Upper     |  |  |  |  | Nominal Thickness (in): 2.50 |                |      |      |      |                |                |                |                |                |      |     |      |     |      |      |      |     |      |     |       |      |                                                                                                                                                                                                                                                                                                                  |      |      |      |     |     |     |     |      |      |         |           |                |      |     |               |      |      |               |      |      |               |     |      |     |     |     |     |      |     |      |     |     |       |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |  |  |  |  |  |  |  |         |           |               |     |      |              |     |      |              |      |      |              |     |      |              |      |      |              |     |      |  |     |      |  |     |      |  |     |      |  |      |      |  |
| Mix Type: _____                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                |                |                |                | Underlying Layer: HMA - New |  |  |  |  | Contract Unit Price: \$66.50 |                |      |      |      |                |                |                |                |                |      |     |      |     |      |      |      |     |      |     |       |      |                                                                                                                                                                                                                                                                                                                  |      |      |      |     |     |     |     |      |      |         |           |                |      |     |               |      |      |               |      |      |               |     |      |     |     |     |     |      |     |      |     |     |       |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |  |  |  |  |  |  |  |         |           |               |     |      |              |     |      |              |      |      |              |     |      |              |      |      |              |     |      |  |     |      |  |     |      |  |     |      |  |      |      |  |
| Core Data Used: QC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                |                |                |                |                             |  |  |  |  |                              |                |      |      |      |                |                |                |                |                |      |     |      |     |      |      |      |     |      |     |       |      |                                                                                                                                                                                                                                                                                                                  |      |      |      |     |     |     |     |      |      |         |           |                |      |     |               |      |      |               |      |      |               |     |      |     |     |     |     |      |     |      |     |     |       |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |  |  |  |  |  |  |  |         |           |               |     |      |              |     |      |              |      |      |              |     |      |              |      |      |              |     |      |  |     |      |  |     |      |  |     |      |  |      |      |  |
| Nuclear Density Gauge Adjusted Difference                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                |                |                |                |                             |  |  |  |  | Location Comparison          |                |      |      |      |                |                |                |                |                |      |     |      |     |      |      |      |     |      |     |       |      |                                                                                                                                                                                                                                                                                                                  |      |      |      |     |     |     |     |      |      |         |           |                |      |     |               |      |      |               |      |      |               |     |      |     |     |     |     |      |     |      |     |     |       |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |  |  |  |  |  |  |  |         |           |               |     |      |              |     |      |              |      |      |              |     |      |              |      |      |              |     |      |  |     |      |  |     |      |  |     |      |  |      |      |  |
| <table border="1"> <thead> <tr> <th>Core</th> <th>QC-1</th> <th>QC-2</th> <th>QV-1</th> <th>QV-2</th> </tr> <tr> <th>Enter Serial #</th> <th>Enter Serial #</th> <th>Enter Serial #</th> <th>Enter Serial #</th> <th>Enter Serial #</th> </tr> </thead> <tbody> <tr><td>UL-1</td><td>1.0</td><td>1.2</td><td>1.2</td><td>1.4</td></tr> <tr><td>UL-2</td><td>1.0</td><td>1.4</td><td>1.0</td><td>0.6</td></tr> <tr><td>UL-3</td><td>-3.3</td><td>-3.8</td><td>-3.4</td><td>-2.9</td></tr> <tr><td>UL-4</td><td>0.8</td><td>1.3</td><td>1.4</td><td>1.0</td></tr> <tr><td>UL-5</td><td>-1.4</td><td>-1.4</td><td>-1.5</td><td>-0.9</td></tr> <tr><td>UL-6</td><td>0.4</td><td>1.1</td><td>0.5</td><td>0.7</td></tr> <tr><td>UL-7</td><td>0.5</td><td>0.9</td><td>0.6</td><td>0.2</td></tr> <tr><td>UL-8</td><td>0.6</td><td>0.4</td><td>0.4</td><td>0.0</td></tr> <tr><td>UL-9</td><td>0.6</td><td>-0.3</td><td>0.5</td><td>0.4</td></tr> <tr><td>UL-10</td><td>-0.7</td><td>-0.9</td><td>-0.7</td><td>-0.3</td></tr> </tbody> </table> |                |                |                |                |                             |  |  |  |  | Core                         | QC-1           | QC-2 | QV-1 | QV-2 | Enter Serial # | Enter Serial # | Enter Serial # | Enter Serial # | Enter Serial # | UL-1 | 1.0 | 1.2  | 1.2 | 1.4  | UL-2 | 1.0  | 1.4 | 1.0  | 0.6 | UL-3  | -3.3 | -3.8                                                                                                                                                                                                                                                                                                             | -3.4 | -2.9 | UL-4 | 0.8 | 1.3 | 1.4 | 1.0 | UL-5 | -1.4 | -1.4    | -1.5      | -0.9           | UL-6 | 0.4 | 1.1           | 0.5  | 0.7  | UL-7          | 0.5  | 0.9  | 0.6           | 0.2 | UL-8 | 0.6 | 0.4 | 0.4 | 0.0 | UL-9 | 0.6 | -0.3 | 0.5 | 0.4 | UL-10 | -0.7 | -0.9 | -0.7 | -0.3 | <table border="1"> <thead> <tr> <th>Average</th> <th>Std. Dev.</th> <th>Suspect Core?</th> </tr> </thead> <tbody> <tr><td>1.0</td><td>0.34</td><td>Suspect Core</td></tr> <tr><td>1.0</td><td>0.33</td><td>Suspect Core</td></tr> <tr><td>-3.3</td><td>0.37</td><td>Suspect Core</td></tr> <tr><td>1.1</td><td>0.28</td><td>Suspect Core</td></tr> <tr><td>-1.3</td><td>0.27</td><td>Suspect Core</td></tr> <tr><td>0.7</td><td>0.30</td><td></td></tr> <tr><td>0.5</td><td>0.28</td><td></td></tr> <tr><td>0.3</td><td>0.27</td><td></td></tr> <tr><td>0.3</td><td>0.39</td><td></td></tr> <tr><td>-0.7</td><td>0.24</td><td></td></tr> </tbody> </table> |  |  |  |  |  |  |  |  |  | Average | Std. Dev. | Suspect Core? | 1.0 | 0.34 | Suspect Core | 1.0 | 0.33 | Suspect Core | -3.3 | 0.37 | Suspect Core | 1.1 | 0.28 | Suspect Core | -1.3 | 0.27 | Suspect Core | 0.7 | 0.30 |  | 0.5 | 0.28 |  | 0.3 | 0.27 |  | 0.3 | 0.39 |  | -0.7 | 0.24 |  |
| Core                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | QC-1           | QC-2           | QV-1           | QV-2           |                             |  |  |  |  |                              |                |      |      |      |                |                |                |                |                |      |     |      |     |      |      |      |     |      |     |       |      |                                                                                                                                                                                                                                                                                                                  |      |      |      |     |     |     |     |      |      |         |           |                |      |     |               |      |      |               |      |      |               |     |      |     |     |     |     |      |     |      |     |     |       |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |  |  |  |  |  |  |  |         |           |               |     |      |              |     |      |              |      |      |              |     |      |              |      |      |              |     |      |  |     |      |  |     |      |  |     |      |  |      |      |  |
| Enter Serial #                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Enter Serial # | Enter Serial # | Enter Serial # | Enter Serial # |                             |  |  |  |  |                              |                |      |      |      |                |                |                |                |                |      |     |      |     |      |      |      |     |      |     |       |      |                                                                                                                                                                                                                                                                                                                  |      |      |      |     |     |     |     |      |      |         |           |                |      |     |               |      |      |               |      |      |               |     |      |     |     |     |     |      |     |      |     |     |       |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |  |  |  |  |  |  |  |         |           |               |     |      |              |     |      |              |      |      |              |     |      |              |      |      |              |     |      |  |     |      |  |     |      |  |     |      |  |      |      |  |
| UL-1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 1.0            | 1.2            | 1.2            | 1.4            |                             |  |  |  |  |                              |                |      |      |      |                |                |                |                |                |      |     |      |     |      |      |      |     |      |     |       |      |                                                                                                                                                                                                                                                                                                                  |      |      |      |     |     |     |     |      |      |         |           |                |      |     |               |      |      |               |      |      |               |     |      |     |     |     |     |      |     |      |     |     |       |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |  |  |  |  |  |  |  |         |           |               |     |      |              |     |      |              |      |      |              |     |      |              |      |      |              |     |      |  |     |      |  |     |      |  |     |      |  |      |      |  |
| UL-2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 1.0            | 1.4            | 1.0            | 0.6            |                             |  |  |  |  |                              |                |      |      |      |                |                |                |                |                |      |     |      |     |      |      |      |     |      |     |       |      |                                                                                                                                                                                                                                                                                                                  |      |      |      |     |     |     |     |      |      |         |           |                |      |     |               |      |      |               |      |      |               |     |      |     |     |     |     |      |     |      |     |     |       |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |  |  |  |  |  |  |  |         |           |               |     |      |              |     |      |              |      |      |              |     |      |              |      |      |              |     |      |  |     |      |  |     |      |  |     |      |  |      |      |  |
| UL-3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | -3.3           | -3.8           | -3.4           | -2.9           |                             |  |  |  |  |                              |                |      |      |      |                |                |                |                |                |      |     |      |     |      |      |      |     |      |     |       |      |                                                                                                                                                                                                                                                                                                                  |      |      |      |     |     |     |     |      |      |         |           |                |      |     |               |      |      |               |      |      |               |     |      |     |     |     |     |      |     |      |     |     |       |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |  |  |  |  |  |  |  |         |           |               |     |      |              |     |      |              |      |      |              |     |      |              |      |      |              |     |      |  |     |      |  |     |      |  |     |      |  |      |      |  |
| UL-4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 0.8            | 1.3            | 1.4            | 1.0            |                             |  |  |  |  |                              |                |      |      |      |                |                |                |                |                |      |     |      |     |      |      |      |     |      |     |       |      |                                                                                                                                                                                                                                                                                                                  |      |      |      |     |     |     |     |      |      |         |           |                |      |     |               |      |      |               |      |      |               |     |      |     |     |     |     |      |     |      |     |     |       |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |  |  |  |  |  |  |  |         |           |               |     |      |              |     |      |              |      |      |              |     |      |              |      |      |              |     |      |  |     |      |  |     |      |  |     |      |  |      |      |  |
| UL-5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | -1.4           | -1.4           | -1.5           | -0.9           |                             |  |  |  |  |                              |                |      |      |      |                |                |                |                |                |      |     |      |     |      |      |      |     |      |     |       |      |                                                                                                                                                                                                                                                                                                                  |      |      |      |     |     |     |     |      |      |         |           |                |      |     |               |      |      |               |      |      |               |     |      |     |     |     |     |      |     |      |     |     |       |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |  |  |  |  |  |  |  |         |           |               |     |      |              |     |      |              |      |      |              |     |      |              |      |      |              |     |      |  |     |      |  |     |      |  |     |      |  |      |      |  |
| UL-6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 0.4            | 1.1            | 0.5            | 0.7            |                             |  |  |  |  |                              |                |      |      |      |                |                |                |                |                |      |     |      |     |      |      |      |     |      |     |       |      |                                                                                                                                                                                                                                                                                                                  |      |      |      |     |     |     |     |      |      |         |           |                |      |     |               |      |      |               |      |      |               |     |      |     |     |     |     |      |     |      |     |     |       |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |  |  |  |  |  |  |  |         |           |               |     |      |              |     |      |              |      |      |              |     |      |              |      |      |              |     |      |  |     |      |  |     |      |  |     |      |  |      |      |  |
| UL-7                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 0.5            | 0.9            | 0.6            | 0.2            |                             |  |  |  |  |                              |                |      |      |      |                |                |                |                |                |      |     |      |     |      |      |      |     |      |     |       |      |                                                                                                                                                                                                                                                                                                                  |      |      |      |     |     |     |     |      |      |         |           |                |      |     |               |      |      |               |      |      |               |     |      |     |     |     |     |      |     |      |     |     |       |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |  |  |  |  |  |  |  |         |           |               |     |      |              |     |      |              |      |      |              |     |      |              |      |      |              |     |      |  |     |      |  |     |      |  |     |      |  |      |      |  |
| UL-8                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 0.6            | 0.4            | 0.4            | 0.0            |                             |  |  |  |  |                              |                |      |      |      |                |                |                |                |                |      |     |      |     |      |      |      |     |      |     |       |      |                                                                                                                                                                                                                                                                                                                  |      |      |      |     |     |     |     |      |      |         |           |                |      |     |               |      |      |               |      |      |               |     |      |     |     |     |     |      |     |      |     |     |       |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |  |  |  |  |  |  |  |         |           |               |     |      |              |     |      |              |      |      |              |     |      |              |      |      |              |     |      |  |     |      |  |     |      |  |     |      |  |      |      |  |
| UL-9                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 0.6            | -0.3           | 0.5            | 0.4            |                             |  |  |  |  |                              |                |      |      |      |                |                |                |                |                |      |     |      |     |      |      |      |     |      |     |       |      |                                                                                                                                                                                                                                                                                                                  |      |      |      |     |     |     |     |      |      |         |           |                |      |     |               |      |      |               |      |      |               |     |      |     |     |     |     |      |     |      |     |     |       |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |  |  |  |  |  |  |  |         |           |               |     |      |              |     |      |              |      |      |              |     |      |              |      |      |              |     |      |  |     |      |  |     |      |  |     |      |  |      |      |  |
| UL-10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | -0.7           | -0.9           | -0.7           | -0.3           |                             |  |  |  |  |                              |                |      |      |      |                |                |                |                |                |      |     |      |     |      |      |      |     |      |     |       |      |                                                                                                                                                                                                                                                                                                                  |      |      |      |     |     |     |     |      |      |         |           |                |      |     |               |      |      |               |      |      |               |     |      |     |     |     |     |      |     |      |     |     |       |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |  |  |  |  |  |  |  |         |           |               |     |      |              |     |      |              |      |      |              |     |      |              |      |      |              |     |      |  |     |      |  |     |      |  |     |      |  |      |      |  |
| Average                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Std. Dev.      | Suspect Core?  |                |                |                             |  |  |  |  |                              |                |      |      |      |                |                |                |                |                |      |     |      |     |      |      |      |     |      |     |       |      |                                                                                                                                                                                                                                                                                                                  |      |      |      |     |     |     |     |      |      |         |           |                |      |     |               |      |      |               |      |      |               |     |      |     |     |     |     |      |     |      |     |     |       |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |  |  |  |  |  |  |  |         |           |               |     |      |              |     |      |              |      |      |              |     |      |              |      |      |              |     |      |  |     |      |  |     |      |  |     |      |  |      |      |  |
| 1.0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 0.34           | Suspect Core   |                |                |                             |  |  |  |  |                              |                |      |      |      |                |                |                |                |                |      |     |      |     |      |      |      |     |      |     |       |      |                                                                                                                                                                                                                                                                                                                  |      |      |      |     |     |     |     |      |      |         |           |                |      |     |               |      |      |               |      |      |               |     |      |     |     |     |     |      |     |      |     |     |       |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |  |  |  |  |  |  |  |         |           |               |     |      |              |     |      |              |      |      |              |     |      |              |      |      |              |     |      |  |     |      |  |     |      |  |     |      |  |      |      |  |
| 1.0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 0.33           | Suspect Core   |                |                |                             |  |  |  |  |                              |                |      |      |      |                |                |                |                |                |      |     |      |     |      |      |      |     |      |     |       |      |                                                                                                                                                                                                                                                                                                                  |      |      |      |     |     |     |     |      |      |         |           |                |      |     |               |      |      |               |      |      |               |     |      |     |     |     |     |      |     |      |     |     |       |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |  |  |  |  |  |  |  |         |           |               |     |      |              |     |      |              |      |      |              |     |      |              |      |      |              |     |      |  |     |      |  |     |      |  |     |      |  |      |      |  |
| -3.3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 0.37           | Suspect Core   |                |                |                             |  |  |  |  |                              |                |      |      |      |                |                |                |                |                |      |     |      |     |      |      |      |     |      |     |       |      |                                                                                                                                                                                                                                                                                                                  |      |      |      |     |     |     |     |      |      |         |           |                |      |     |               |      |      |               |      |      |               |     |      |     |     |     |     |      |     |      |     |     |       |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |  |  |  |  |  |  |  |         |           |               |     |      |              |     |      |              |      |      |              |     |      |              |      |      |              |     |      |  |     |      |  |     |      |  |     |      |  |      |      |  |
| 1.1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 0.28           | Suspect Core   |                |                |                             |  |  |  |  |                              |                |      |      |      |                |                |                |                |                |      |     |      |     |      |      |      |     |      |     |       |      |                                                                                                                                                                                                                                                                                                                  |      |      |      |     |     |     |     |      |      |         |           |                |      |     |               |      |      |               |      |      |               |     |      |     |     |     |     |      |     |      |     |     |       |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |  |  |  |  |  |  |  |         |           |               |     |      |              |     |      |              |      |      |              |     |      |              |      |      |              |     |      |  |     |      |  |     |      |  |     |      |  |      |      |  |
| -1.3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 0.27           | Suspect Core   |                |                |                             |  |  |  |  |                              |                |      |      |      |                |                |                |                |                |      |     |      |     |      |      |      |     |      |     |       |      |                                                                                                                                                                                                                                                                                                                  |      |      |      |     |     |     |     |      |      |         |           |                |      |     |               |      |      |               |      |      |               |     |      |     |     |     |     |      |     |      |     |     |       |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |  |  |  |  |  |  |  |         |           |               |     |      |              |     |      |              |      |      |              |     |      |              |      |      |              |     |      |  |     |      |  |     |      |  |     |      |  |      |      |  |
| 0.7                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 0.30           |                |                |                |                             |  |  |  |  |                              |                |      |      |      |                |                |                |                |                |      |     |      |     |      |      |      |     |      |     |       |      |                                                                                                                                                                                                                                                                                                                  |      |      |      |     |     |     |     |      |      |         |           |                |      |     |               |      |      |               |      |      |               |     |      |     |     |     |     |      |     |      |     |     |       |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |  |  |  |  |  |  |  |         |           |               |     |      |              |     |      |              |      |      |              |     |      |              |      |      |              |     |      |  |     |      |  |     |      |  |     |      |  |      |      |  |
| 0.5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 0.28           |                |                |                |                             |  |  |  |  |                              |                |      |      |      |                |                |                |                |                |      |     |      |     |      |      |      |     |      |     |       |      |                                                                                                                                                                                                                                                                                                                  |      |      |      |     |     |     |     |      |      |         |           |                |      |     |               |      |      |               |      |      |               |     |      |     |     |     |     |      |     |      |     |     |       |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |  |  |  |  |  |  |  |         |           |               |     |      |              |     |      |              |      |      |              |     |      |              |      |      |              |     |      |  |     |      |  |     |      |  |     |      |  |      |      |  |
| 0.3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 0.27           |                |                |                |                             |  |  |  |  |                              |                |      |      |      |                |                |                |                |                |      |     |      |     |      |      |      |     |      |     |       |      |                                                                                                                                                                                                                                                                                                                  |      |      |      |     |     |     |     |      |      |         |           |                |      |     |               |      |      |               |      |      |               |     |      |     |     |     |     |      |     |      |     |     |       |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |  |  |  |  |  |  |  |         |           |               |     |      |              |     |      |              |      |      |              |     |      |              |      |      |              |     |      |  |     |      |  |     |      |  |     |      |  |      |      |  |
| 0.3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 0.39           |                |                |                |                             |  |  |  |  |                              |                |      |      |      |                |                |                |                |                |      |     |      |     |      |      |      |     |      |     |       |      |                                                                                                                                                                                                                                                                                                                  |      |      |      |     |     |     |     |      |      |         |           |                |      |     |               |      |      |               |      |      |               |     |      |     |     |     |     |      |     |      |     |     |       |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |  |  |  |  |  |  |  |         |           |               |     |      |              |     |      |              |      |      |              |     |      |              |      |      |              |     |      |  |     |      |  |     |      |  |     |      |  |      |      |  |
| -0.7                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 0.24           |                |                |                |                             |  |  |  |  |                              |                |      |      |      |                |                |                |                |                |      |     |      |     |      |      |      |     |      |     |       |      |                                                                                                                                                                                                                                                                                                                  |      |      |      |     |     |     |     |      |      |         |           |                |      |     |               |      |      |               |      |      |               |     |      |     |     |     |     |      |     |      |     |     |       |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |  |  |  |  |  |  |  |         |           |               |     |      |              |     |      |              |      |      |              |     |      |              |      |      |              |     |      |  |     |      |  |     |      |  |     |      |  |      |      |  |
| Core Absolute Value                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                |                |                |                |                             |  |  |  |  | Core Absolute Value          |                |      |      |      |                |                |                |                |                |      |     |      |     |      |      |      |     |      |     |       |      |                                                                                                                                                                                                                                                                                                                  |      |      |      |     |     |     |     |      |      |         |           |                |      |     |               |      |      |               |      |      |               |     |      |     |     |     |     |      |     |      |     |     |       |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |  |  |  |  |  |  |  |         |           |               |     |      |              |     |      |              |      |      |              |     |      |              |      |      |              |     |      |  |     |      |  |     |      |  |     |      |  |      |      |  |
| <table border="1"> <thead> <tr> <th>Core</th> <th>Absolute Value</th> </tr> </thead> <tbody> <tr><td>UL-1</td><td>1.0</td></tr> <tr><td>UL-2</td><td>1.0</td></tr> <tr><td>UL-3</td><td>3.3</td></tr> <tr><td>UL-4</td><td>0.8</td></tr> <tr><td>UL-5</td><td>1.4</td></tr> <tr><td>UL-6</td><td>0.4</td></tr> <tr><td>UL-7</td><td>0.5</td></tr> <tr><td>UL-8</td><td>0.6</td></tr> <tr><td>UL-9</td><td>0.6</td></tr> <tr><td>UL-10</td><td>0.7</td></tr> </tbody> </table>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                |                |                |                |                             |  |  |  |  | Core                         | Absolute Value | UL-1 | 1.0  | UL-2 | 1.0            | UL-3           | 3.3            | UL-4           | 0.8            | UL-5 | 1.4 | UL-6 | 0.4 | UL-7 | 0.5  | UL-8 | 0.6 | UL-9 | 0.6 | UL-10 | 0.7  | <table border="1"> <thead> <tr> <th>Average</th> <th>Std. Dev.</th> <th>Suspect Gauge?</th> </tr> </thead> <tbody> <tr><td>1.0</td><td>0.8</td><td>Suspect Gauge</td></tr> <tr><td>0.84</td><td>0.96</td><td>Suspect Gauge</td></tr> <tr><td>0.90</td><td>0.82</td><td>Suspect Gauge</td></tr> </tbody> </table> |      |      |      |     |     |     |     |      |      | Average | Std. Dev. | Suspect Gauge? | 1.0  | 0.8 | Suspect Gauge | 0.84 | 0.96 | Suspect Gauge | 0.90 | 0.82 | Suspect Gauge |     |      |     |     |     |     |      |     |      |     |     |       |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |  |  |  |  |  |  |  |         |           |               |     |      |              |     |      |              |      |      |              |     |      |              |      |      |              |     |      |  |     |      |  |     |      |  |     |      |  |      |      |  |
| Core                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Absolute Value |                |                |                |                             |  |  |  |  |                              |                |      |      |      |                |                |                |                |                |      |     |      |     |      |      |      |     |      |     |       |      |                                                                                                                                                                                                                                                                                                                  |      |      |      |     |     |     |     |      |      |         |           |                |      |     |               |      |      |               |      |      |               |     |      |     |     |     |     |      |     |      |     |     |       |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |  |  |  |  |  |  |  |         |           |               |     |      |              |     |      |              |      |      |              |     |      |              |      |      |              |     |      |  |     |      |  |     |      |  |     |      |  |      |      |  |
| UL-1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 1.0            |                |                |                |                             |  |  |  |  |                              |                |      |      |      |                |                |                |                |                |      |     |      |     |      |      |      |     |      |     |       |      |                                                                                                                                                                                                                                                                                                                  |      |      |      |     |     |     |     |      |      |         |           |                |      |     |               |      |      |               |      |      |               |     |      |     |     |     |     |      |     |      |     |     |       |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |  |  |  |  |  |  |  |         |           |               |     |      |              |     |      |              |      |      |              |     |      |              |      |      |              |     |      |  |     |      |  |     |      |  |     |      |  |      |      |  |
| UL-2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 1.0            |                |                |                |                             |  |  |  |  |                              |                |      |      |      |                |                |                |                |                |      |     |      |     |      |      |      |     |      |     |       |      |                                                                                                                                                                                                                                                                                                                  |      |      |      |     |     |     |     |      |      |         |           |                |      |     |               |      |      |               |      |      |               |     |      |     |     |     |     |      |     |      |     |     |       |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |  |  |  |  |  |  |  |         |           |               |     |      |              |     |      |              |      |      |              |     |      |              |      |      |              |     |      |  |     |      |  |     |      |  |     |      |  |      |      |  |
| UL-3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 3.3            |                |                |                |                             |  |  |  |  |                              |                |      |      |      |                |                |                |                |                |      |     |      |     |      |      |      |     |      |     |       |      |                                                                                                                                                                                                                                                                                                                  |      |      |      |     |     |     |     |      |      |         |           |                |      |     |               |      |      |               |      |      |               |     |      |     |     |     |     |      |     |      |     |     |       |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |  |  |  |  |  |  |  |         |           |               |     |      |              |     |      |              |      |      |              |     |      |              |      |      |              |     |      |  |     |      |  |     |      |  |     |      |  |      |      |  |
| UL-4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 0.8            |                |                |                |                             |  |  |  |  |                              |                |      |      |      |                |                |                |                |                |      |     |      |     |      |      |      |     |      |     |       |      |                                                                                                                                                                                                                                                                                                                  |      |      |      |     |     |     |     |      |      |         |           |                |      |     |               |      |      |               |      |      |               |     |      |     |     |     |     |      |     |      |     |     |       |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |  |  |  |  |  |  |  |         |           |               |     |      |              |     |      |              |      |      |              |     |      |              |      |      |              |     |      |  |     |      |  |     |      |  |     |      |  |      |      |  |
| UL-5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 1.4            |                |                |                |                             |  |  |  |  |                              |                |      |      |      |                |                |                |                |                |      |     |      |     |      |      |      |     |      |     |       |      |                                                                                                                                                                                                                                                                                                                  |      |      |      |     |     |     |     |      |      |         |           |                |      |     |               |      |      |               |      |      |               |     |      |     |     |     |     |      |     |      |     |     |       |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |  |  |  |  |  |  |  |         |           |               |     |      |              |     |      |              |      |      |              |     |      |              |      |      |              |     |      |  |     |      |  |     |      |  |     |      |  |      |      |  |
| UL-6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 0.4            |                |                |                |                             |  |  |  |  |                              |                |      |      |      |                |                |                |                |                |      |     |      |     |      |      |      |     |      |     |       |      |                                                                                                                                                                                                                                                                                                                  |      |      |      |     |     |     |     |      |      |         |           |                |      |     |               |      |      |               |      |      |               |     |      |     |     |     |     |      |     |      |     |     |       |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |  |  |  |  |  |  |  |         |           |               |     |      |              |     |      |              |      |      |              |     |      |              |      |      |              |     |      |  |     |      |  |     |      |  |     |      |  |      |      |  |
| UL-7                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 0.5            |                |                |                |                             |  |  |  |  |                              |                |      |      |      |                |                |                |                |                |      |     |      |     |      |      |      |     |      |     |       |      |                                                                                                                                                                                                                                                                                                                  |      |      |      |     |     |     |     |      |      |         |           |                |      |     |               |      |      |               |      |      |               |     |      |     |     |     |     |      |     |      |     |     |       |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |  |  |  |  |  |  |  |         |           |               |     |      |              |     |      |              |      |      |              |     |      |              |      |      |              |     |      |  |     |      |  |     |      |  |     |      |  |      |      |  |
| UL-8                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 0.6            |                |                |                |                             |  |  |  |  |                              |                |      |      |      |                |                |                |                |                |      |     |      |     |      |      |      |     |      |     |       |      |                                                                                                                                                                                                                                                                                                                  |      |      |      |     |     |     |     |      |      |         |           |                |      |     |               |      |      |               |      |      |               |     |      |     |     |     |     |      |     |      |     |     |       |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |  |  |  |  |  |  |  |         |           |               |     |      |              |     |      |              |      |      |              |     |      |              |      |      |              |     |      |  |     |      |  |     |      |  |     |      |  |      |      |  |
| UL-9                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 0.6            |                |                |                |                             |  |  |  |  |                              |                |      |      |      |                |                |                |                |                |      |     |      |     |      |      |      |     |      |     |       |      |                                                                                                                                                                                                                                                                                                                  |      |      |      |     |     |     |     |      |      |         |           |                |      |     |               |      |      |               |      |      |               |     |      |     |     |     |     |      |     |      |     |     |       |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |  |  |  |  |  |  |  |         |           |               |     |      |              |     |      |              |      |      |              |     |      |              |      |      |              |     |      |  |     |      |  |     |      |  |     |      |  |      |      |  |
| UL-10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 0.7            |                |                |                |                             |  |  |  |  |                              |                |      |      |      |                |                |                |                |                |      |     |      |     |      |      |      |     |      |     |       |      |                                                                                                                                                                                                                                                                                                                  |      |      |      |     |     |     |     |      |      |         |           |                |      |     |               |      |      |               |      |      |               |     |      |     |     |     |     |      |     |      |     |     |       |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |  |  |  |  |  |  |  |         |           |               |     |      |              |     |      |              |      |      |              |     |      |              |      |      |              |     |      |  |     |      |  |     |      |  |     |      |  |      |      |  |
| Average                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Std. Dev.      | Suspect Gauge? |                |                |                             |  |  |  |  |                              |                |      |      |      |                |                |                |                |                |      |     |      |     |      |      |      |     |      |     |       |      |                                                                                                                                                                                                                                                                                                                  |      |      |      |     |     |     |     |      |      |         |           |                |      |     |               |      |      |               |      |      |               |     |      |     |     |     |     |      |     |      |     |     |       |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |  |  |  |  |  |  |  |         |           |               |     |      |              |     |      |              |      |      |              |     |      |              |      |      |              |     |      |  |     |      |  |     |      |  |     |      |  |      |      |  |
| 1.0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 0.8            | Suspect Gauge  |                |                |                             |  |  |  |  |                              |                |      |      |      |                |                |                |                |                |      |     |      |     |      |      |      |     |      |     |       |      |                                                                                                                                                                                                                                                                                                                  |      |      |      |     |     |     |     |      |      |         |           |                |      |     |               |      |      |               |      |      |               |     |      |     |     |     |     |      |     |      |     |     |       |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |  |  |  |  |  |  |  |         |           |               |     |      |              |     |      |              |      |      |              |     |      |              |      |      |              |     |      |  |     |      |  |     |      |  |     |      |  |      |      |  |
| 0.84                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 0.96           | Suspect Gauge  |                |                |                             |  |  |  |  |                              |                |      |      |      |                |                |                |                |                |      |     |      |     |      |      |      |     |      |     |       |      |                                                                                                                                                                                                                                                                                                                  |      |      |      |     |     |     |     |      |      |         |           |                |      |     |               |      |      |               |      |      |               |     |      |     |     |     |     |      |     |      |     |     |       |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |  |  |  |  |  |  |  |         |           |               |     |      |              |     |      |              |      |      |              |     |      |              |      |      |              |     |      |  |     |      |  |     |      |  |     |      |  |      |      |  |
| 0.90                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 0.82           | Suspect Gauge  |                |                |                             |  |  |  |  |                              |                |      |      |      |                |                |                |                |                |      |     |      |     |      |      |      |     |      |     |       |      |                                                                                                                                                                                                                                                                                                                  |      |      |      |     |     |     |     |      |      |         |           |                |      |     |               |      |      |               |      |      |               |     |      |     |     |     |     |      |     |      |     |     |       |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |  |  |  |  |  |  |  |         |           |               |     |      |              |     |      |              |      |      |              |     |      |              |      |      |              |     |      |  |     |      |  |     |      |  |     |      |  |      |      |  |

Figure 22: Suspect Cores/Gauges Example.

Figure 23: Removed Suspect Cores Example.

### 13. QC-X / QV-X Density Worksheets

These worksheets (Figure 24) only appears when either “Combined Density and Volumetrics” or “Density-Only” is selected as the Test Strip Type on the *Project Info & Instructions* worksheet. These are the field density worksheets that should be used for the test strip by the density technicians. These worksheets can be saved as PDFs and printed from the *Project Info & Instructions* worksheet if desired. These worksheets must be filled out to complete the nuclear gauge correlation.

The Department Representative will enter the following information into the worksheet received from the density technicians:

- Density and Moisture Standards
- Gauge Serial Number
- QC/QV Technician Name
- M Counts / D Counts for Reading 1
- Wet Density 1 (PCF)
- M Counts / D Counts for Reading 2
- Wet Density 2 (PCF)
- M Counts / D Counts for Reading 3 (if required)
- Wet Density 3 (PCF) (if required)
- Test Remarks

|  <b>DENSITY TEST STRIP WORKSHEET QC-1</b><br>Wisconsin Department of Transportation                                                                                                                                                                                                                                                                                  |         |                |                   |               |                 |                                |                        |                 |                                 |                                             |                 |             |               |              |  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|----------------|-------------------|---------------|-----------------|--------------------------------|------------------------|-----------------|---------------------------------|---------------------------------------------|-----------------|-------------|---------------|--------------|--|
| Project ID: _____                                                                                                                                                                                                                                                                                                                                                                                                                                       |         |                | Road Name: _____  |               |                 | Contractor: _____              |                        |                 | Density Standard: 25760         |                                             |                 |             |               |              |  |
| Project Leader: _____                                                                                                                                                                                                                                                                                                                                                                                                                                   |         |                | County: Jefferson |               |                 | QC Technician: _____           |                        |                 | Moisture Standard: 9224         |                                             |                 |             |               |              |  |
| Test Strip: 1                                                                                                                                                                                                                                                                                                                                                                                                                                           |         |                | Layer: Upper      |               |                 | QV Technician: _____           |                        |                 | Gauge Serial #: 6470            |                                             |                 |             |               |              |  |
| <small> • Offsets are predetermined according to the test strip layout in WisDOT's Manual of Test Procedures WTP H-002.<br/> • Gauge offset is set to ZERO since offsets will be determined from the test strip.<br/> • The Target Max Gmm is the average from the 3 split samples, except for a density only test strip, then it is the daily average Gmm from production.<br/> • Calculated per WisDOT's Manual of Test Procedures WTM T355. </small> |         |                |                   |               |                 | Start: 403+93      End: 375+57 |                        |                 | Mix Type: 4-MT-58-285           |                                             |                 |             |               |              |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                         |         |                |                   |               |                 | Length (ft): 2,836.1           |                        |                 | Target Gmm: 2,457               |                                             |                 |             |               |              |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                         |         |                |                   |               |                 | Lane Width (ft): 12.0          |                        |                 | Target Max Density (PCF): 152.9 |                                             |                 |             |               |              |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                         |         |                |                   |               |                 | Thickness (in): 2.50           |                        |                 | Required Density (%): 93.0      |                                             |                 |             |               |              |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                         |         |                |                   |               |                 | Gauge Offset: 0.0              |                        |                 | Date Placed: 9/23/2025          |                                             |                 |             |               |              |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                         |         |                |                   |               |                 |                                |                        |                 | Date Tested: 9/23/2025          |                                             |                 |             |               |              |  |
| Testing Locations                                                                                                                                                                                                                                                                                                                                                                                                                                       |         |                |                   | Reading 1     |                 |                                | Reading 2 (rotate 180) |                 |                                 | Reading 3 (if needed, original orientation) |                 |             | Final Density |              |  |
| Lot / Sublot ID                                                                                                                                                                                                                                                                                                                                                                                                                                         | Station | Offset from CL | M Count / D Count | Wet Density 1 | % Max Density 1 | M Count / D Count              | Wet Density 2          | % Max Density 2 | M Count / D Count               | Wet Density 3                               | % Max Density 3 | Average PCF | % Max Density |              |  |
| Zone 1                                                                                                                                                                                                                                                                                                                                                                                                                                                  | UL-1    | 393+73         | 1.5               | 1772 / 12121  | 141.1           | 92.3%                          | 1858 / 12305           | 139.7           | 91.4%                           | 1866 / 12125                                | 141.0           | 92.2%       | 141.1         | 92.3%        |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                         | UL-2    | 393+23         | 3.5               | 1974 / 12084  | 141.4           | 92.5%                          | 1883 / 12140           | 140.9           | 92.2%                           |                                             |                 |             | 141.2         | 92.3%        |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                         | UL-3    | 392+73         | 6.0               | 1976 / 12087  | 141.3           | 92.4%                          | 1921 / 11935           | 142.5           | 93.2%                           |                                             |                 |             | 141.9         | 92.8%        |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                         | UL-4    | 392+23         | 8.5               | 1798 / 12050  | 141.6           | 92.6%                          | 1801 / 11938           | 142.5           | 93.2%                           |                                             |                 |             | 142.1         | 92.9%        |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                         | UL-5    | 391+73         | 10.5              | 1866 / 11983  | 142.2           | 93.0%                          | 1907 / 12003           | 142.0           | 92.9%                           |                                             |                 |             | 142.1         | 92.9%        |  |
| Zone 2                                                                                                                                                                                                                                                                                                                                                                                                                                                  | UL-6    | 385+48         | 1.5               | 1883 / 12051  | 141.6           | 92.6%                          | 1839 / 12136           | 141.0           | 92.2%                           |                                             |                 |             | 141.3         | 92.4%        |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                         | UL-7    | 384+98         | 3.5               | 1833 / 12082  | 141.4           | 92.5%                          | 1850 / 11910           | 142.7           | 93.3%                           | 1882 / 11826                                | 143.4           | 93.8%       | 143.1         | 93.6%        |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                         | UL-8    | 384+48         | 6.0               | 1900 / 11967  | 142.3           | 93.1%                          | 1890 / 11821           | 143.4           | 93.8%                           | 1943 / 12078                                | 141.4           | 92.5%       | 142.4         | 93.1%        |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                         | UL-9    | 383+98         | 8.5               | 1810 / 12241  | 140.1           | 91.6%                          | 1887 / 12149           | 140.9           | 92.2%                           |                                             |                 |             | 140.5         | 91.9%        |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                         | UL-10   | 383+48         | 10.5              | 1836 / 12040  | 141.7           | 92.7%                          | 1839 / 19158           | 142.3           | 93.1%                           |                                             |                 |             | 142.0         | 92.9%        |  |
| Target Max Density = Gmm x 62.24                                                                                                                                                                                                                                                                                                                                                                                                                        |         |                |                   |               |                 |                                |                        |                 |                                 |                                             |                 |             |               | Test Remarks |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                         |         |                |                   |               |                 |                                |                        |                 |                                 |                                             |                 |             |               |              |  |

Figure 24: QC-X / QV-X Field Density Worksheet Example.

## 14. QC-X / QV-X Correlation

These worksheets only appears when either “Combined Density and Volumetrics” or “Density-Only” is selected as the Test Strip Type on the *Project Info & Instructions* worksheet. These worksheets are used to review the correlation of each nuclear gauge.

No information is to be entered into this worksheet.

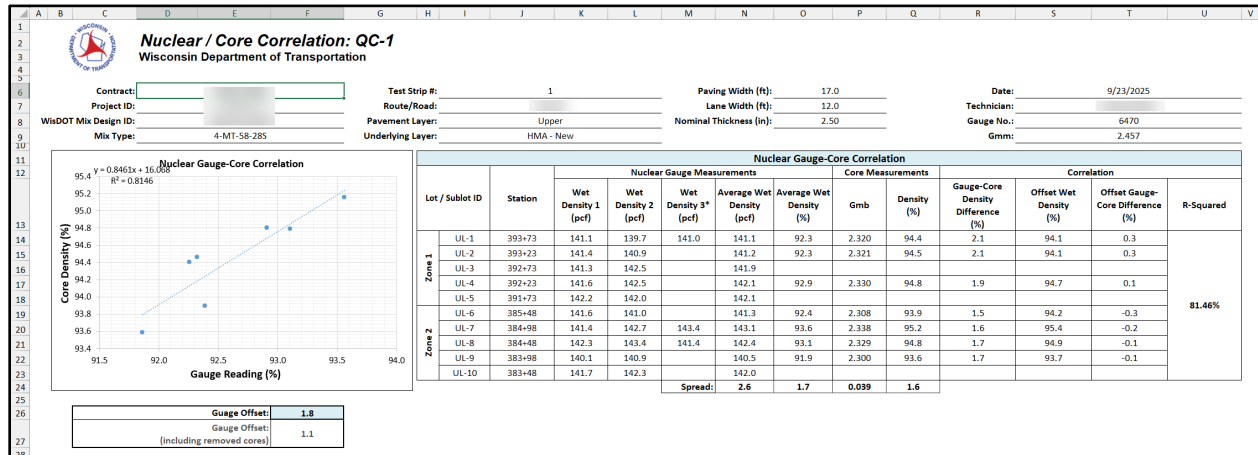


Figure 25: QC-X / QV-X Correlation Example.

Notes:

- Cores that were removed from the analysis on the *Core Data* worksheet will not appear in the tables nor will they affect the correlation.



## **15. Appendix**

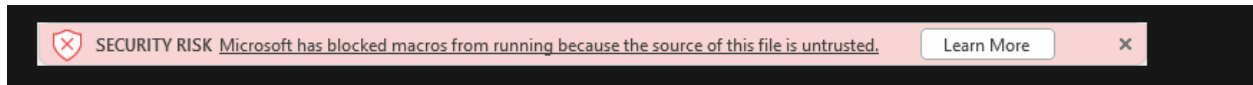
### **15.1 t-Testing**

The spreadsheet adheres to the specifications for determining whether QC and QV data compare by conducting paired t-tests on *Split Sample Comparison* data.

The t-tests during the test strip use an alpha value of 0.01. The alpha value determines the likelihood of a “false flag” or a failed comparison due to factors other than an actual difference in the population (or material source). Using an alpha value of 0.01, the t-test will fail 1 in 10 times (or about 10% of the time) when the two datasets are actually from the same population. The t-tests “pass” or compare when the p-value from either test is greater than alpha.

## 15.2 Enabling Macros (Red Banner)

As of February 23, 2023, Microsoft has blocked macros by default from spreadsheets downloaded from the internet (i.e.: Pantry) to provide additional protection from malicious macros. When this occurs, you will see an error like this at the top of the spreadsheet:

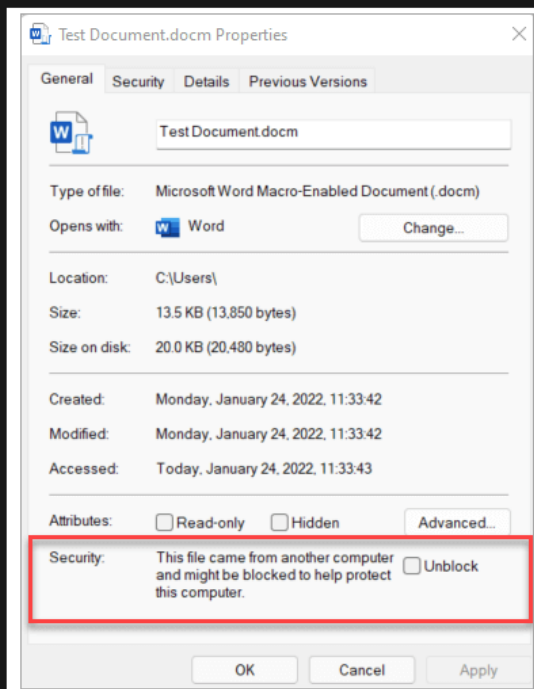


When this error is presented, you will be unable to enable macros using old methods where you could simply click the button in the banner to enable macros. Additional steps are required to enable the macros. Perform the following steps to enable macros:

### Guidance on allowing VBA macros to run in files you trust

#### Remove Mark of the Web from a file

For an individual file, such as a file downloaded from an internet location or an email attachment the user has saved to their local device, the simplest way to unblock macros is to remove Mark of the Web. To remove, right-click on the file, choose **Properties**, and then select the **Unblock** checkbox on the **General** tab.



Additional information about this change can be found on Microsoft's website at:  
<https://learn.microsoft.com/en-us/deployoffice/security/internet-macros-blocked>

### 15.3 Rounding and Precision

The HMA & SMA Test Strip Worksheet performs many calculations automatically. In all cases where values are calculated, such as Air Voids, VMA, etc., the values carry fully precision through intermediate calculations and are NOT rounded to the precision that they are specified to in the Standard Specifications EXCEPT for acceptance decisions. The following shown precisions are used for the following parameters:

- Air Voids: 0.1
- VMA: 0.1
- Specific Gravities: 0.001

The Lot Means, Standard Deviations, PWL Values, and Pay Factors are NOT rounded and use the full precision through their subsequent calculations.

Additionally, while not rounded, the following values are shown in the worksheet with the following precision:

- Length: 0.1
- Width: 0.1
- Thickness: 0.01
- Tonnage: 0.01
- Means: Precision specified in the Standard Spec for the respective JMF parameter.
  - Example: Standard Spec 460.2.1(2) states that the JMF Air Void target during production is 3.0 percent. Therefore, the average is shown to this precision, 0.1 percent.
- Variances & Standard Deviations: One more decimal than the precision of the associated Mean.
  - Example: Air Voids are specified to 0.1 precision, so the variance and standard deviation precision is 0.01.
- PWL: 0.01
- Pay Factor (PF): 0.01

## 15.4 User Modes

The HMA & SMA Test Strip worksheet can operate in 3 selectable User Modes:

- User Mode
  - The default operational mode.
    - This mode should be used most of the time.
  - Workbook integrity is locked.
  - Worksheet integrity is locked.
  - Hides all TSS and Administrator mode worksheets.
  - Access via hotkey: CTRL + W
    - No password required.
- TSS Mode
  - Elevated privilege mode.
    - Use to change worksheet pre-programmed behaviors such as pay adjustments.
  - Workbook integrity is locked.
  - Worksheet integrity is unlocked.
  - Reveals additional worksheets:
    - Data Summary
  - Access via hotkey: CTRL + Q
    - No password required.
- Administrator Mode
  - Highest privilege mode.
    - Only available to BTS.
  - Workbook integrity is unlocked.
  - Worksheet integrity is unlocked.
  - Reveals ALL hidden worksheets, including the TSS worksheets and the following Administrator Worksheets:
    - INTERNAL\_SYS\_MSGS
    - INTERNAL\_SYS\_VAR
    - INTERNAL\_SYS\_RECORD
    - County-Region Database
  - Access via hotkey: CTRL + G
    - Password Required.