Use this SPV for HMA PWL QMP core only projects. Include the HMA Pavement Longitudinal Joint Density SPV, Core Pilot Project.

Follow design guidance in FDM 19-21.

The unit price should be a fixed cost of $1.00 in AWP for the two bid items.

Insert Appendix A - Test Methods & Sampling for HMA PWL QMP Projects with this SPV. It covers the following:

1. Density testing by cores.

2. Sampling of HMA material.

3. Calculation of mainline tonnage.

1. **HMA Pavement Percent Within Limits (PWL) QMP, Core Only Project;  
   Incentive Density PWL HMA Pavement, Item SPV.0055.XXX;  
   Incentive Air Voids HMA Pavement SPV.0055.XXX.**

**A Description**

This special provision describes percent within limits (PWL) pay determination, providing and maintaining a contractor Quality Control (QC) Program, department Quality Verification (QV) Program, required sampling and testing, dispute resolution, corrective action, pavement density, and payment for HMA pavements. Pay is determined by statistical analysis performed on contractor and department test results conducted according to the Quality Management Program (QMP) as specified in standard spec 460, except as modified below.

**B Materials**

Conform to the requirements of standard specs 450, 455, and 460 except where superseded by this special provision. The department will allow only one mix design for each HMA mixture type per layer required for the contract, unless approved by the engineer. The use of more than one mix design for each HMA pavement layer will require the contractor to construct a new test strip in accordance with HMA Pavement Percent Within Limits (PWL) QMP Test Strip Volumetrics article at no additional cost to the department. The HMA Pavement Percent Within Limits (PWL) QMP Test Strip Density article will not be added to the Core Only Projects. The contractor may correlate gauges by taking up to 10 additional cores (non-production) at any location during the project. The department will not correlate any gauges.

*Replace standard spec 460.2.8.2.1.3.1 Contracts with 5000 Tons of Mixture or Greater with the following:*

**460.2.8.2.1.3.1 Contracts under Percent within Limits**

(1) Furnish and maintain a laboratory at the plant site fully equipped for performing contractor QC testing. Have the laboratory on-site and operational before beginning mixture production.

(2) Obtain random samples and perform tests according to this special provision and further defined in Appendix A: *Test Methods & Sampling for HMA PWL QMP Projects*. Obtain HMA mixture samples from trucks at the plant. For the sublot in which a QV sample is collected, discard the QC sample and test a split of the QV sample.

(3) Perform sampling from the truck box according to WTM R97 and four-part splitting of HMA samples according to WTM R47*.* Sample size must be adequate to run the appropriate required tests in addition to one set of duplicate tests that may be required for dispute resolution (i.e., retained). This requires sample sizes which yield four splits for all random sampling per sublot. All QC samples shall provide the following: QC, QV, Retained, and Extra. Take possession of the QC and Extra split samples intended for QC testing. The department will observe the splitting and take possession of the QV and Retained split samples intended for QV testing. Additional sampling details are found in Appendix A. Label samples according to WTM R97.

(4) Test the QC split sample using the test methods identified below at a frequency greater than or equal to that indicated. The Extra split sample shall be tested only when the Gmm and/or Gmb replicate tolerances are exceeded according to WTM T166 section 13.1.4 and WTM T209 section 14.1.1. When testing the Extra split sample, only the results from the test from which the tolerances were exceeded may replace the results from the QC split sample. The Rule of Retained according to CMM 836.1.2 applies.

* Blended aggregate gradations in accordance with WTM T30.
* Asphalt content (AC) in percent.

Determine AC using one of the following methods:

* AC by ignition oven according to WTM T308. If the department is using an ignition oven to determine AC, conform to WTP H-003. If the department is not using an ignition oven to determine AC, IOCFs must still be reverified for any of the reasons listed in WTP H-003 Table 2 and conform to WTP H-003 section 3.
* AC by chemical extraction according to AASHTO T164 Method A or B.
* AC by automated extraction according to WTM D8159.
* Bulk specific gravity (Gmb) of the compacted mixture according to WTM T166.
* Maximum specific gravity (Gmm) according to WTM T209.
* Air voids (Va) by calculation according to WTM T269.
* Voids in Mineral Aggregate (VMA) by calculation according to WTM R35 section 9.2.

(5) Lot size shall consist of 3,750 tons with sublots of 750 tons. Test each design mixture at a frequency of 1 test per 750 tons of mixture type produced and placed as part of the contract. Add a random sample for any fraction of 750 tons at the end of production for a specific mixture design. Partial lots with less than three sublot tests will be included into the previous lot for data analysis and pay adjustment. Volumetric lots will include all tonnage of mixture type under specified bid item unless otherwise specified in the plan.

(6) Conduct field tensile strength ratio tests according to WTM T283 on each qualifying mixture in accordance with CMM 836.6.14. Test each full 50,000-ton production increment, or fraction of an increment, after the first 5,000 tons of production. Perform required increment testing in the first week of production of that increment. If field tensile strength ratio values are below the spec limit, notify the engineer. The engineer and contractor will jointly determine a corrective action.

*Delete standard spec 460.2.8.2.1.5 and 460.2.8.2.1.6.*

*Replace standard spec 460.2.8.2.1.7 Corrective Action with the following:*

**460.2.8.2.1.7 Corrective Action**

(1) Material must conform to the following action and acceptance limits based on individual QC and QV test results (tolerances relative to the JMF used on the PWL Test Strip):

ITEM ACTION LIMITS ACCEPTANCE LIMITS

Percent passing given sieve:

37.5-mm +/- 8.0

25.0-mm +/- 8.0

19.0-mm +/- 7.5

12.5-mm +/- 7.5

9.5-mm +/- 7.5

2.36-mm +/- 7.0

75-µm +/- 3.0

AC in percent -0.3 -0.5

Va - 1.5 & +2.0

VMA in percent*[1]* - 0.5 -1.0

*[1]* VMA limits based on minimum requirement for mix design nominal maximum aggregate size in table 460‑1.

(2) QV samples will be tested for Gmm, Gmb, and AC. Air voids and VMA will then be calculated using these test results.

(3) Notify the engineer if any individual test result falls outside the action limits, investigate the cause and take corrective action to return to within action limits. If two consecutive test results fall outside the action limits, stop production. Production may not resume until approved by the engineer. Additional QV samples may be collected upon resuming production, at the discretion of the engineer.

(4) For any additional non-random tests outside the random number testing conducted for volumetrics, the data collected will not be entered into PWL calculations. Additional QV tests must meet acceptance limits or be subject to production stop. If the department’s non-random test does not conform to the acceptance limits, the retained sample will be tested by the BTS lab. If the BTS results also do not meet the acceptance limits, the material will be considered unacceptable as described in (5) below.

(5) Remove and replace unacceptable material at no additional expense to the department. Unacceptable material is defined as any individual QC or QV tests results outside the acceptance limits or a PWL value < 50. For AC in percent, unacceptable material is defined as any individual QV test result outside of the acceptance limit. The engineer may allow such material to remain in place with a price reduction. The department will pay for such HMA Pavement allowed to remain in place at 50 percent of the contract unit price.

*Replace standard spec 460.2.8.3.1.2 Personnel Requirements with the following:*

**460.2.8.3.1.2 Personnel Requirements**

(1) The department will provide at least one HTCP-certified Transportation Materials Sampling (TMS) Technician, to observe QV sampling of HMA mixtures.

(2) Under departmental observation, a contractor TMS technician shall collect and split samples.

(3) A department HTCP-certified Hot Mix Asphalt, Technician I, Production Tester (HMA-IPT) technician will ensure that all sampling is performed correctly and conduct testing, analyze test results, and report resulting data.

(4) The department will make an organizational chart available to the contractor before mixture production begins. The organizational chart will include names, telephone numbers, and current certifications of all QV testing personnel. The department will update the chart with appropriate changes, as they become effective.

*Replace standard spec 460.2.8.3.1.4 Department Verification Testing Requirements with the following:*

**460.2.8.3.1.4 Department Verification Testing Requirements**

(1) HTCP-certified department personnel will obtain QV random samples by directly supervising HTCP-certified contractor personnel sampling from trucks at the plant. Sample size must be adequate to run the appropriate required tests in addition to one set of duplicate tests that may be required for dispute resolution (i.e., retained). This requires sample sizes which yield four splits for all random sampling per sublot. All QV samples shall furnish the following: QC, QV, Retained, and Extra. The department will observe the splitting and take possession of the QV, Retained, and Extra split samples intended for QV testing. The department will take possession of retained samples accumulated to date each day QV samples are collected. The department will retain samples until surpassing the analysis window of up to 5 lots, as defined in 460.2.8.3.1.7(2) of this special provision. Additional sampling details are found in Appendix A.

(2) The department will verify product quality using the test methods specified here in 460.2.8.3.1.4(3). The department will identify test methods before construction starts and use only those methods during production of that material unless the engineer and contractor mutually agree otherwise.

(3) The department will test the QV split sample using the test methods identified below at the frequency indicated. The Extra split sample will be tested only when the Gmm and/or Gmb replicate tolerances are exceeded according to WTM T166 section 13.1.4 and WTM T209 section 14.1.1. When testing the Extra split sample, only the results from the test from which the tolerances were exceeded may replace the results from the QV split sample. The Rule of Retained according to CMM 836.1.2 applies. In the event that both the department and contractor’s replicate tolerances are exceeded, perform dispute resolution according to 460.2.8.3.1.7(2).

* Bulk specific gravity (Gmb) of the compacted mixture according to WTM T166.
* Maximum specific gravity (Gmm) according to WTM T209.
* Air voids (Va) by calculation according to WTM T269.
* Voids in Mineral Aggregate (VMA) by calculation according to WTM R35 section 9.2.
* Asphalt Content (AC) in percent determined by ignition oven method according to WTM T308 and conforming to WTP H-003, chemical extraction according to AASHTO T164 Method A or B, or automated extraction according to WTM D8159.

(4) The department will randomly test each design mixture at the minimum frequency of one test for each lot.

*Delete standard spec 460.2.8.3.1.6.*

*Replace standard spec 460.2.8.3.1.7 Dispute Resolution with the following:*

**460.2.8.3.1.7 Data Analysis for Volumetrics**

(1) Analysis of test data for pay determination will be contingent upon QC and QV test results. Statistical analysis will be conducted on Gmm and Gmb test results for calculation of Va. If either Gmm or Gmb analysis results in non-comparable data as described in 460.2.8.3.1.7(2), subsequent testing will be performed for both parameters as detailed in the following paragraph.

(2) The engineer, upon completion of the first 3 lots, will compare the variances (F-test) and the means (t‑test) of the QV test results with the QC test results. Additional comparisons incorporating the first 3 lots of data will be performed following completion of the 4th and 5th lots (i.e., lots 1-3, 1-4, and 1-5). A rolling window of 5 lots will be used to conduct F & t comparison for the remainder of the contract (i.e., lots 2-6, then lots 3-7, etc.), reporting comparison results for each individual lot. Analysis will use a set alpha value of 0.025. If the F- and t-tests report comparable data, the QC and QV data sets are determined to be statistically similar and QC data will be used to calculate the Va used in PWL and pay adjustment calculations. If the F- and t-tests result in non-comparable data, proceed to the *dispute resolution* steps found below. Note: if both QC and QV Va PWL result in a pay adjustment of 102% or greater, dispute resolution testing will not be conducted. Dispute resolution via further investigation is as follows:

[1] The Retained portion of the split from the lot in the analysis window with a QV test result furthest from the QV mean (not necessarily the sublot identifying that variances or means do not compare) will be referee tested for Gmm, Gmb, and Asphalt Content by the bureau's AASHTO accredited laboratory and certified personnel. All previous lots within the analysis window are subject to referee testing and regional lab testing as deemed necessary. Referee test results will replace the QV data of the sublot(s).

[2] Statistical analysis will be conducted with referee test results replacing QV results.

1. If the F- and t-tests indicate variances and means compare, no further testing is required for the lot and QC data will be used for PWL and pay factor/adjustment calculations.
2. If the F- and t-tests indicate non-comparable variances or means, the Retained portion of the random QC sample will be tested for Gmm, Gmb, and Asphalt Content by the department’s regional lab for the remaining 4 sublots of the lot which the F- and t- tests indicate non‑comparable datasets. The department’s regional lab and the referee test results will be used for PWL and pay factor/adjustment calculations. Upon the second instance of non-comparable variance or means and for every instance thereafter, the department will assess a pay reduction for the additional testing of the remaining 4 sublots at $2,000/lot under the HMA Regional Lab Testing administrative item.

[3] The contractor may choose to dispute the regional test results on a lot basis within 7 days after receiving results from the region. In this event, the retained portion of each sublot will be referee tested by the department's AASHTO accredited laboratory and certified personnel. The referee Gmm and Gmb test results will supersede the regional lab results for the disputed lot.

1. If referee testing results in an increased calculated pay factor, the department will pay for the cost of the additional referee testing.
2. If referee testing of a disputed lot results in an equal or lower calculated pay factor, the department will assess a pay reduction for the additional referee testing at $2,000/lot under the Referee Testing administrative item.

(3) The department will notify the contractor of the referee test results within 3 working days after receipt of the samples by the department's AASHTO accredited laboratory. The intent is to provide referee test results within 7 calendar days from completion of the lot.

(4) The department will determine mixture conformance and acceptability by analyzing referee test results, reviewing mixture data, and inspecting the completed pavement, this special provision, and accompanying Appendix A.

(5) Unacceptable material (i.e., resulting in a PWL value less than 50 or individual QC or QV test results not meeting the Acceptance Requirements of 460.2.8.2.1.7 as modified herein) will be referee tested by the bureau's AASHTO accredited laboratory and certified personnel and those test results used for analysis. Such material may be subject to remove and replace, at the discretion of the engineer. If the engineer allows the material to remain in place, it will be paid at 50% of the HMA Pavement contract unit price. Replacement or pay adjustment will be conducted on a sublot basis. If an entire PWL sublot is removed and replaced, the test results of the newly placed material will replace the original data for the sublot. Any remove and replace shall be performed at no additional cost to the department. Testing of replaced material must include a minimum of one QV result. [Note: If the removed and replaced material does not result in replacement of original QV data, an additional QV test will be conducted and under such circumstances will be entered into the [HMA PWL Production spreadsheet](http://wisconsindot.gov/Documents/doing-bus/eng-consultants/cnslt-rsrces/tools/qmp/hma-pwl-production-4-26-2018.xlsm) for data analysis and pay determination.] The quantity of material paid at 50% the contract unit price will be deducted from PWL pay adjustments, along with accompanying data of this material.

*Delete standard spec 460.2.8.3.1.8 Corrective Action.*

**C Construction**

*Replace standard spec 460.3.3.2 Pavement Density Determination with the following:*

**460.3.3.2 Pavement Density Determination by Cores**

(1) For mainline pavement, determine density with cores. Full width passing lanes, turn lanes, or auxiliary lanes must be 1,500 lane feet or greater to be eligible for PWL density. Shoulder and appurtenance density will accepted by cores and shall have average lot (daily) densities conforming to standard spec Table 460-3 or else be subject to disincentives according to 460.5.2.2(5) herein. No density incentive will be applied to shoulders or appurtenances.

(2) The engineer will determine the target maximum density using department procedures described in WTM T355 and CMM 815. The engineer will determine density as soon as practicable after compaction and before placement of subsequent layers or before opening to traffic.

(3) A lot is defined as 7,500 lane feet with sublots of 1,500 lane feet (excluding shoulder, even if paved integrally) and placed within a single layer for each location and target maximum density category indicated in table 460‑3. A partial quantity less than 750 lane feet will be included with the previous sublot. Partial lots with less than three sublots will be included in the previous lot for data analysis/acceptance and pay, by the engineer.

(4) Under the direct observation of the engineer, cut 100 or 150 mm (4 or 6 inch) diameter cores from the pavement according to WTM R67 and Table 1 at one random location, determined by the engineer, per sublot. Each core will represent the entire length and width of the sublot. Cores will be cut by the next day, except if the next day is not a working day, then they shall be cut within 48 hours after placement. Fill core holes according to WTM R67 section 5.8 and obtain engineer approval before opening to traffic. Prepare cores and determine density according to WTM T166. Dry cores after testing according WTM R79. The department will label cores, transport cores to testing facilities, witness testing, store dried cores, and provide subsequent verification testing.

Table 1: Core Density Testing[1]

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Application** | **Test Method** | **Test Locations** | **Frequency** | | |
| Mainline | WTM R67 | WTP H-002 | 1 / 1,500 LF | | |
| Shoulders & Appurtenances | **Width ≤ 5 ft.** | **5 ft. < Width ≤ 9 ft.** | **Width > 9 ft.** |
| 1 / 4,500 LF | 1 / 3,000 LF | 1 / 1,500 LF |

[1] Replaces Table 1 in WTP H-002 for shoulder and appurtenant testing.

(5) If a core is damaged at the time of coring, immediately take a replacement core 1 foot ahead of the existing testing location in the direction of traffic at the same offset as the damaged core. If a core is damaged during transport, record it as damaged and notify the engineer immediately.

(6) Do not re-roll compacted mixtures with deficient density test results. Do not operate continuously below the specified minimum density. Stop production, identify the source of the problem, and make corrections to produce work meeting the specification requirements.

*Replace standard spec 460.3.3.3 Waiving Density Testing with Acceptance of Density Data with the following:*

**460.3.3.3 Analysis of Density Data**

(1) As random density locations are paved, the core data will be recorded in the HMA PWL Production Spreadsheet for analysis in chronological order. Each lot will contain core density data from a single HMA mixture type placed over a specific underlying material.

(2) The department reserves the right to verify the density of any core and the department’s result may be used for PWL and pay adjustment calculations, at the discretion of the engineer.

(3) The department will determine mixture density conformance and acceptability by analyzing test results, reviewing mixture data, and inspecting the completed pavement according to standard spec, this special provision, and accompanying Appendix A.

(4) Upon the completion of each lot, core data will be used by the department for PWL and pay adjustment calculation.

(5) Density resulting in a PWL value less than 50 or not meeting the requirements of 460.3.3.1 (any individual density test result falling more than 3.0 percent below the minimum required target maximum density as specified in standard spec Table 460-3) is unacceptable and may be subject to remove and replace at no additional cost to the department, at the discretion of the engineer.

1. Replacement is conducted on a sublot basis. If an entire PWL sublot is removed and replaced, the test results of the newly placed material will replace the original data for the sublot.
2. Testing of replaced material must include a minimum of one QV result. [Note: If the removed and replaced material does not result in replacement of original QV data, an additional QV test must be conducted and under such circumstances will be entered into the data analysis and pay determination.]
3. If the engineer allows such material to remain in place, it will be paid for at 50% of the HMA Pavement contract unit price. The extent of unacceptable material will be addressed as specified in CMM 815.11. The quantity of material paid at 50% the contract unit price will be deducted from PWL pay adjustments, along with accompanying data of this material.

**D Measurement**

The department will measure the HMA Pavement bid items acceptably completed by the ton as specified in standard spec 450.4 and as follows in standard spec 460.5 as modified in this special provision.

**E Payment**

*Replace standard spec 460.5.2 HMA Pavement with the following:*

**460.5.2 HMA Pavement**

**460.5.2.1 General**

(1) Payment for HMA Pavement Type LT, MT, and HT mixes is full compensation for providing HMA mixture designs; for preparing foundation; for furnishing, preparing, hauling, mixing, placing, and compacting mixture; for HMA PWL QMP testing and aggregate source testing; for warm mix asphalt additives or processes; for stabilizer, hydrated lime and liquid antistripping agent, if required; and for all materials including asphaltic materials.

(2) If provided for in the plan quantities, the department will pay for a leveling layer, placed to correct irregularities in an existing paved surface before overlaying, under the pertinent paving bid item. Absent a plan quantity, the department will pay for a leveling layer as extra work.

**460.5.2.2 Calculation of Pay Adjustment for HMA Pavement using PWL**

(1) Pay adjustments will be calculated using 65 dollars per ton of HMA pavement. The [HMA PWL Production Spreadsheet](http://wisconsindot.gov/Documents/doing-bus/eng-consultants/cnslt-rsrces/tools/qmp/hma-pwl-production-4-26-2018.xlsm), including data, will be made available to the contractor by the department as soon as practicable upon completion of each lot. The department will pay for measured quantities of mix based on this price multiplied by the following pay adjustment calculated in accordance with the [HMA PWL Production Spreadsheet](http://wisconsindot.gov/Documents/doing-bus/eng-consultants/cnslt-rsrces/tools/qmp/hma-pwl-production-4-26-2018.xlsm):

**PAY FACTOR FOR HMA PAVEMENT AIR VOIDS & DENSITY**

*PERCENT WITHIN LIMITS PAYMENT FACTOR, PF*

*(PWL) (percent of $65/ton)*

> 90 to 100 PF = ((PWL – 90) \* 0.4) + 100

> 50 to < 90 (PWL \* 0.5) + 55

<50 50%[1]

where PF is calculated per air voids and density, denoted PFair voids & PFdensity.

*[1]* Any material resulting in PWL value less than 50 shall be removed and replaced unless the engineer allows such material to remain in place. In the event the material remains in place, it will be paid at 50% of the contract unit price of HMA pavement.

(2) For air voids, PWL values will be calculated using lower and upper specification limits of 2.0 and 4.3 percent, respectively. Lower specification limits for density shall be in accordance with standard spec Table 460-3.

(3) Pay adjustment will be determined on a lot basis and will be computed as shown in the following equation.

Pay Adjustment = (PF-100)/100 x (WP) x (tonnage) x ($65/ton)\*

\*Note: If the Pay Factor = 50%, the contract unit price will be used in lieu of $65/ton and the weighted percentage (WP) will equal 1.0. The following weighted percentage (WP) values will be used for the corresponding parameter:

|  |  |
| --- | --- |
| Parameter | WP |
| Air Voids | 0.5 |
| Density | 0.5 |

(4) Individual Pay Factors for each air voids (PFair voids) and density (PFdensity) will be determined. PFair voids will be multiplied by the total tonnage placed (i.e., from truck tickets), and PFdensity will be multiplied by the calculated tonnage used to pave the mainline only (i.e., traffic lanes excluding shoulder) as determined in accordance with Appendix A.

(5) Pay adjustment for shoulders and appurtenances accepted by department testing will be determined on a lot basis. If the lot density is less than the specified minimum in table 460-3, the department will reduce pay based on the contract unit price for the HMA pavement bid item for that lot as follows:

DISINCENTIVE PAY REDUCTION FOR HMA PAVEMENT DENSITY

PERCENT LOT DENSITY PAYMENT FACTOR

BELOW SPECIFIED MINIMUM (percent of contract price)

From 0.5 to 1.0 inclusive 98

From 1.1 to 1.5 inclusive 95

From 1.6 to 2.0 inclusive 91

From 2.1 to 2.5 inclusive 85

From 2.6 to 3.0 inclusive 70

More than 3.0*[1]* \_\_\_

*[1]* Remove and replace the lot with a mixture at the specified density. When acceptably replaced, the department will pay for the replaced work at the contract unit price. Alternatively, the engineer may allow the nonconforming material to remain in place with a 50 percent payment factor.

(6)The department will pay incentive for air voids and density under the following bid items:

ITEM NUMBER DESCRIPTION UNIT

SPV.0055.XXX Incentive Density PWL HMA Pavement DOL

SPV.0055.XXX Incentive Air Voids HMA Pavement DOL

(7) The department will administer disincentives under the Disincentive Density HMA Pavement and the Disincentive Air Voids HMA Pavement administrative items.

(8) The department will administer a disincentive under the Disincentive HMA Binder Content administrative item for each individual QV test result indicating asphalt binder content below the Action Limit in 460.2.8.2.1.7 presented herein. The department will adjust pay per sublot of mix at 65 dollars per ton of HMA pavement multiplied by the following pay adjustment calculated according to the [HMA PWL Production Spreadsheet](http://wisconsindot.gov/Documents/doing-bus/eng-consultants/cnslt-rsrces/tools/qmp/hma-pwl-production-4-26-2018.xlsm):

|  |  |
| --- | --- |
| AC Binder Relative to JMF | Pay Adjustment / Sublot |
| -0.4% to -0.5% | 75%[1] |
| More than -0.5% | 50%[1] [2] |

*[1]* Any material resulting in an asphalt binder content more than 0.3% below the JMF AC content will be referee tested by the department’s AASHTO accredited laboratory and HTCP certified personnel using automated extraction according to automated extraction according to WTM D8159.

*[2]* Any material resulting in an asphalt binder content more than 0.5% below the JMF AC content shall be removed and replaced unless the engineer allows such material to remain in place. In the event the material remains in place, it will be paid at 50% of the contract unit price of HMA pavement.

Note: PWL value determination is further detailed in the *PWL Production Spreadsheet Instructions located in the Project Info and Instructions tab* of the [HMA PWL Production spreadsheet](http://wisconsindot.gov/Documents/doing-bus/eng-consultants/cnslt-rsrces/tools/qmp/hma-pwl-production-4-26-2018.xlsm).

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