



DEPARTMENT OF NATURAL RESOURCES

DIVISION OF WATER RESOURCES

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DATE: MAY 1, 2010

To: APPROVED WELL TESTERS
GROUND WATER ASSOCIATIONS
ASSOCIATION CONSULTANTS

FROM: BILL W. TYNER, ASSISTANT DIVISION ENGINEER
DIVISION OF WATER RESOURCES, DIVISION 2

SUBJECT: MEASUREMENT RULE POLICY 2010-03.1B

◆ **CLARIFICATION AND VARIANCE TO AMENDED MEASUREMENT RULE 3.1: TOTALIZING FLOW METER CORRECTION FACTORS (FIELD CALIBRATION)**

PURPOSE

This MEASUREMENT RULE POLICY pertains to RULE 3.1 of the AMENDED RULES GOVERNING THE MEASUREMENT OF TRIBUTARY GROUND WATER DIVERSIONS LOCATED IN THE ARKANSAS RIVER BASIN (AMENDED MEASUREMENT RULES). RULE 3.1.1 defines "acceptable operating condition" for an installed TOTALIZING FLOW METER (TFM) as the indicated flow of the INSTALLED TFM METER being within plus or minus 5% of the flow measured by the CALIBRATED TEST EQUIPMENT.

This POLICY addresses the **FIELD CALIBRATION** of an installed TFM to meet "acceptable operating conditions." This POLICY repeals and replaces the following previously-issued POLICY:

- ◆ MEASUREMENT RULE POLICY 2008-03.1B "CLARIFICATION AND VARIANCE TO AMENDED MEASUREMENT RULE 3.1: TOTALIZING FLOW METER CORRECTION FACTORS (FIELD CALIBRATION)
 - Dated April 1, 2008..... Repealed and Replaced in its entirety

Changes from previous policies related to this issue include:

- ◆ **More restrictive limits on use of CORRECTION FACTORS for TFMs following a one-year variance period.**

APPLICABLE AMENDED MEASUREMENT RULES:

- ◆ AMENDED MEASUREMENT RULE 3.1.1 states:
" ... **An installed flow meter shall be determined to be in accurate operating condition when the indicated flow of the meter is within plus or minus 5% of an independent field measurement** made using calibrated test equipment. ... "

- ◆ AMENDED MEASUREMENT RULE 11 states:

“When the strict application of any provisions of these rules would cause unusual hardship, **the State Engineer may grant a variance for a specific instance provided a written request for the variance is made to the State Engineer** and the State Engineer finds the request justifiable.”
- ◆ Therefore, it is within the STATE ENGINEER’S authority to grant a VARIANCE to allow the use of installed TOTALIZING FLOW METERS (TFMs) that vary by more than plus or minus 5% from the TEST EQUIPMENT **IF** conformance with the plus or minus 5% requirement would cause unusual hardship for the OWNER/OPERATOR of the WELL.
- ◆ This MEASUREMENT RULE POLICY describes:
 - CALCULATION OF CORRECTIONS FACTORS, used to determine ACCURACY, and
 - Conditions under which a VARIANCE to AMENDED MEASUREMENT RULE 3.1.1 can be granted

CALCULATION OF CORRECTION FACTOR

Verification of a TFM must include the comparison of the FLOW RATE of the TEST METER to the FLOW RATE as shown by the INSTALLED TFM. FORM 3.1, NOTICE OF TOTALIZING FLOW METER INSTALLATION, CERTIFICATION OR RE-VERIFICATION, provides the method to be used in performing that comparison:

$$CF = \frac{\text{Ave. QT}}{\text{Ave. QI}}$$

WHERE: AVE. QT = the AVERAGE FLOW RATE of the TEST METER **to the nearest 0.00** GPM
 AVE. QI = the AVERAGE FLOW RATE of the INSTALLED TFM **to the nearest 0.00** GPM
 CF = CORRECTION FACTOR **to the nearest 0.000**

POLICY FOR APPLICATION OF CORRECTION FACTOR

Determinations of ACCURACY assume a degree of precision that is unattainable under normal field conditions. The factors affecting the measurement of FLOW RATES are numerous and uncontrollable, including the condition of the PUMP and the INSTALLED TFM. Because of these uncontrollable factors, DIVISION 2 has determined that limited use of CORRECTION FACTORS for TFMs is within the intent of RULE 11 OF THE AMENDED RULES GOVERNING THE MEASUREMENT OF TRIBUTARY GROUND WATER DIVERSIONS LOCATED IN THE ARKANSAS RIVER BASIN (AMENDED MEASUREMENT RULES) and has adopted the following as

ACCEPTABLE STANDARD VARIANCES:

INSTALLED TFM ACCURACY	CORRECTION FACTOR	ADDITIONAL ACTION REQUIRED BY WATER WELL METER TESTER
0.0% to ±5.0%	0.950 to 1.050	No additional action required.
±5.0% to ±8.0%	0.920 to 0.950 OR 1.050 to 1.080	REQUEST FOR VARIANCE must be submitted with FORM 3.1.
±8.0% to ±10.0%	0.900 to 0.920 OR 1.080 to 1.100	REQUEST FOR VARIANCE must be submitted with FORM 3.1. <u>TEST WILL BE VALID FOR ONE YEAR ONLY. No later than one year from the date of this Test a new MEASUREMENT TEST must be conducted and the ACCURACY of the new TEST must be within ±5.0%.</u>
more than ±10.0%	<0.900 or >1.100	<u>UNACCEPTABLE;</u> METER/SYSTEM must be repaired/replaced.

EXAMPLES OF CALCULATION OF INSTALLED TFM ACCURACY

The **INSTALLED TFM ACCURACY** is **1.000** minus the **CORRECTION FACTOR**. The following examples illustrate the method to determine **INSTALLED TFM ACCURACY** and the actions that **DIVISION 2** will take.

Example #1:
 AVE. QT = 99.81 GPM
 AVE. QI = 102.74 GPM

$$CF = \frac{99.81}{102.74} = 0.971$$

 INSTALLED TFM ACCURACY = 1.000 - CF = 1.000 - 0.971 = +0.029
 = +2.9%
DIVISION 2 EVALUATION & ACTION:
 EVALUATION: +2.9% < +5.0% No VARIANCE REQUEST required.
 ACTION: TEST will be valid for four years. NO CORRECTION FACTOR applied.

Example #2:
 AVE. QT = 99.81 GPM
 AVE. QI = 93.87 GPM

$$CF = \frac{99.81}{93.87} = 1.063$$

 INSTALLED TFM ACCURACY = 1.000 - CF = 1.000 - 1.063 = -0.063
 = -6.3%
DIVISION 2 EVALUATIONS & ACTIONS:
 EVALUATION: -5.0% < -6.3% < -8.0% VARIANCE REQUEST required.
 ACTION: TEST will be valid for four years
 CORRECTION FACTOR of 1.063 will be applied to all usage until next TEST.

Example #3:
 AVE. QT = 99.81 GPM
 AVE. QI = 109.85 GPM

$$CF = \frac{99.81}{109.85} = 0.909$$

 INSTALLED TFM ACCURACY = 1.000 - CF = 1.000 - 0.909 = +0.091
 = +9.1%
DIVISION 2 EVALUATIONS & ACTIONS:
 EVALUATION: +8.0% < +9.1% < +10.0%. VARIANCE REQUEST required.
 ACTION: TEST will be valid for one year.
 CORRECTION FACTOR of 0.091 will be applied to all usage
FOR NO MORE THAN ONE YEAR.

Example #4:
 AVE. QT = 99.81 GPM
 AVE. QI = 112.13 GPM

$$CF = \frac{99.81}{112.13} = 0.890$$

 INSTALLED TFM ACCURACY = 1.000 - CF = 1.000 - 0.890 = 0.110
 = +11.0%
DIVISION 2 EVALUATIONS & ACTIONS:
 EVALUATION: +11.0% > +10.0%..... **TEST does not demonstrate compliance**
 with AMENDED MEASUREMENT RULES or associated MEASUREMENT RULE POLICIES.
 ACTION: METER and/or SYSTEM must be repaired/replaced before pumping can occur.

If you have questions about this or other MEASUREMENT RULE POLICIES, contact DIVISION 2 GROUND WATER OPERATIONS at 719.542.3368: Dan DiRezza (Ext. 2202), Dale Baker (Ext. 2121) or Bill Richie (Ext. 2124).