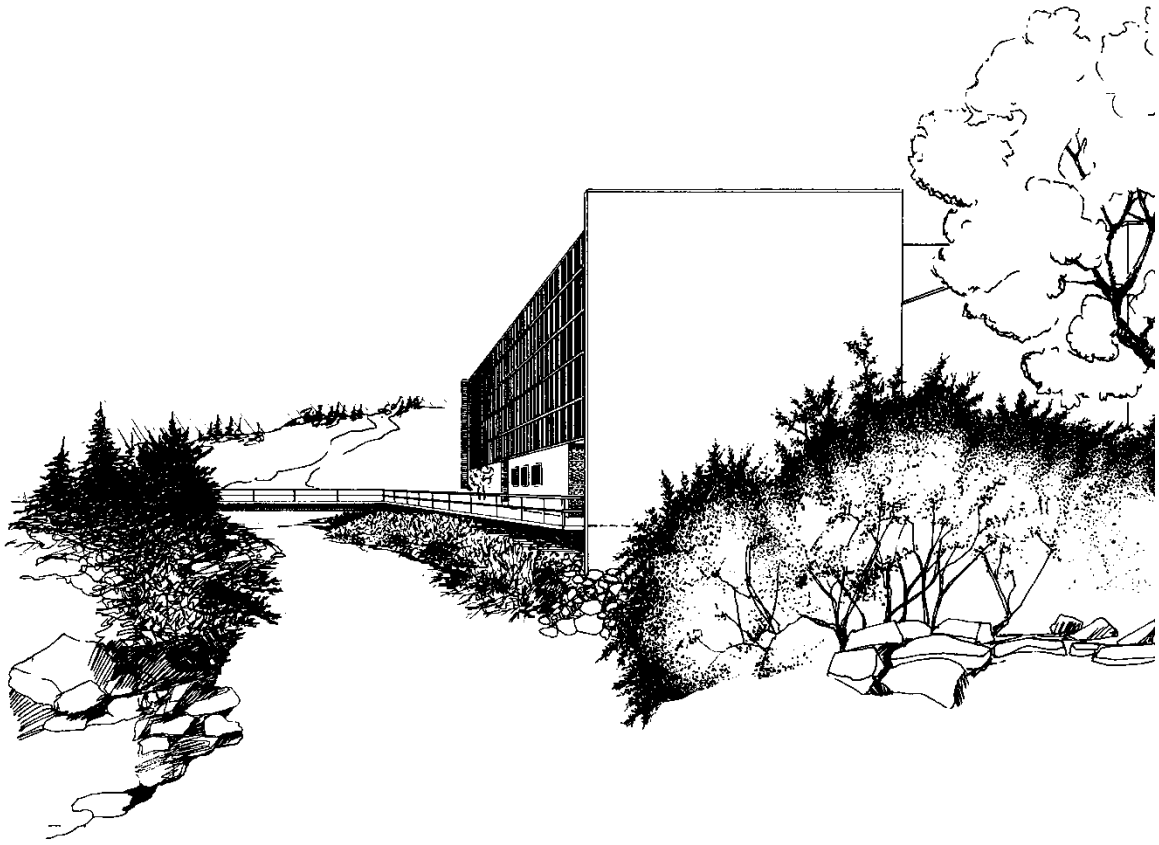
CALIBRATION OF A 10-INCH ULTRASONIC FLOW METER

Meter Serial Number: 25400142
Model: EDGE

Prepared for

GWF

November 2025



UTAH WATER RESEARCH LABORATORY

Report No. 4882

UtahStateUniversity®

CALIBRATION OF A 10-INCH ULTRASONIC FLOW METER

Meter Serial Number: 25400142
Model: EDGE

Submitted to:

GWF AG
Tor 50
Nidfeldstrasse 1
6010 Kriens, Switzerland

By:

Steven L. Barfuss, P.E.
Research Professor

and

Mark Cannon
Research Engineer

Utah Water Research Laboratory
8200 Old Main Hill
Logan, UT 84322-8200

November 2025

Hydraulics Report No. 4882

INTRODUCTION

Utah State University was contracted by GWF to perform a flow calibration at the Utah Water Research Laboratory (UWRL) in Logan, Utah on a 10-inch ultrasonic flow meter (Serial Number: 25400142, Model: EDGE). The meter was tested in straight 10-inch pipe, but also three diameters downstream of a 90-degree elbow. An additional test was also performed with the meter close coupled to the upstream elbow. The cold-water tests were performed to determine the meter's discharge coefficient and flow measurement accuracy over a wide range of flow rates in the three different pipe setups. No one was present to witness the tests.

EXPERIMENT SETUP

Three separate piping configurations were installed in the laboratory for these tests. The first pipe setup consisted of forty feet of straight 10-inch pipe upstream of the meter location and twelve feet of straight 10-inch pipe downstream of the meter location. In addition, over twenty feet of straight 12-inch pipe was also installed upstream of the 10-inch pipe as part of this test setup. The second pipe setup included a short radius 90-degree, 10-inch horizontal elbow, located upstream of the meter (see Figure 1). For this pipe setup, the upstream flange of the meter was installed 30 inches downstream of the elbow flange. Ten feet of 10-inch pipe was installed downstream of the meter for the elbow test. The third pipe setup included the meter being directly connected to the downstream side of the short radius 90-degree elbow (see Figure 3). Ten feet of 10-inch pipe was installed downstream of the meter for this test. The GWF meter was tested in each of these three piping configurations.

FLOW COEFFICIENT

The coefficient C for this meter calibration was calculated using the following equation:

$$C = \frac{Q_a}{Q_i}$$

in which Q_i is the indicated flow rate from the ultrasonic flow meter in gallons per minute and Q_a is the actual laboratory reference flow rate in gallons per minute. A C value of 1.0 would

indicate that the ultrasonic flow meter had a 0% deviation from the reference laboratory flow rate.

Figure 1 – Pipe Setup for Straight Pipe Test (flow goes left to right)

Figure 2 – Pipe Setup for 3D Elbow Test (flow goes left to right)

Figure 3 – Pipe Setup for 0D Elbow Test (flow goes left to right)

PROCEDURE

Water was supplied to each test line from a reservoir near the hydraulics laboratory. The reference flow rate from the laboratory weight tanks and the indicated flow rate from the GWF ultrasonic flow meter were measured for each run. The water temperature was also measured.

All reference flow measurements were made using the laboratory weight tanks. The weight tanks are regularly calibrated and are traceable to the National Institute of Standards and Technology. Discharge during the test was controlled using a 12-inch butterfly valve downstream of each test section.

The meter was DC powered. A Fluke multimeter was used to measure the mA signal coming from the GWF ultrasonic meter during each run (voltage measurement). The factory flow range setting for the meter was 5000gpm and accordingly, this setting was used during the test. No meter settings were changed during or after the calibration.

RESULTS

Table 1 summarizes the test results for the GWF meter calibration when it was tested in straight pipe. Table 2 summarizes the test results for the GWF meter calibration when it was installed 30 inches downstream of the short radius elbow. Table 3 summarizes the test results for the GWF meter calibration when it was installed zero inches downstream of the short radius elbow.

Figure 4 is a plot of pipe velocity versus the percent deviation of flow rate for the GWF meter tests. The legend in Figure 4 has been annotated to describe the specific testing configurations as shown in the tables.

Table 1. Utah Water Research Laboratory Flow Meter Calibration Data

Manufacturer: GWF
Calibration Date: 10/30/25
Calibration Location: North and South test line

Serial Number: 25400142
Model Number: EDGE

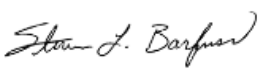
Pipe Setup: Straight Pipe Test
Upstream: 38 feet of Straight Pipe
Downstream: 12.5 feet of Straight Pipe

Meter Inlet Diameter (in.) = 10-inch
Nominal Pipe Dia. = 10-inch
Pipe Diameter (in.) = 10.020
Pipe Area (ft^2) = 0.55
Water Temp. (F) = 41.3
Unit Weight (lb/ft^3) = 62.43
Kin. Visc. (ft^2/s) = 1.63E-05

Calibration Performed by: M. Cannon
Calibration Witnessed by: none

Run No.	UWRL Flow (gpm)	Indicated Flow (gpm)	Meter Range (gpm)	Voltage Reading	Measurement Time (sec)	Pipe Velocity (fps)	Inlet Reynolds Number	C	Dev from mean C (%)	Dev of Flow (%)
1	2	3	4	5	6	7	8	9	10	11
This data was taken using the meter's mA output										
1	246.09	250.00	5000	1.1999	201.59	1.001	51,428	0.9844	-0.59%	1.587%
2	966.05	972.00	5000	1.7775	200.00	3.931	201,884	0.9939	0.37%	0.616%
3	1988.20	2005.13	5000	2.6040	200.00	8.089	415,492	0.9916	0.14%	0.851%
4	2968.62	2996.38	5000	3.3970	200.00	12.078	620,379	0.9907	0.05%	0.935%
5	3923.85	3961.38	5000	4.1690	200.00	15.965	820,003	0.9905	0.03%	0.956%
							Avg. coefficient :	**0.9902**	Avg. Dev :	**0.989%**
							Std. deviation :	**0.0035**		

Certified by:



Steven L. Barfuss P.E.
Research Professor

Table 2. Utah Water Research Laboratory Flow Meter Calibration Data

Manufacturer: GWF
Calibration Date: 10/30/25
Calibration Location: North and South test line

Serial Number: 25400142
Model Number: EDGE

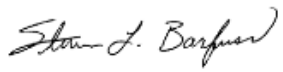
Pipe Setup: Elbow Test
Upstream: 30 inches of Straight Pipe
Downstream: 10 feet of Straight Pipe

Meter Inlet Diameter (in.) = 10-inch
Nominal Pipe Dia. = 10-inch
Pipe Diameter (in.) = 10.020
Pipe Area (ft2) = 0.55
Water Temp. (F) = 41.3
Unit Weight (lb/ft3) = 62.43
Kin. Visc. (ft2/s) = 1.63E-05

Calibration Performed by: M. Cannon
Calibration Witnessed by: none

Run No.	UWRL Flow (gpm)	Indicated Flow (gpm)	Meter Range (gpm)	Voltage Reading	Measurement Time (sec)	Pipe Velocity (fps)	Inlet Reynolds Number	C	Dev from mean C (%)	Dev of Flow (%)
1	2	3	4	5	6	7	8	9	10	11
This data was taken using the meter's mA output (Elbow 1 3D on Chart)										
1	123.39	124.50	5000	1.0995	203.94	0.502	25,786	0.9911	-0.24%	0.898%
2	247.21	249.38	5000	1.1994	203.59	1.006	51,661	0.9913	-0.22%	0.877%
3	988.35	991.00	5000	1.7927	200.00	4.021	206,544	0.9973	0.38%	0.268%
4	1968.06	1985.13	5000	2.5880	200.00	8.007	411,283	0.9914	-0.21%	0.867%
5	2962.15	2988.88	5000	3.3910	200.00	12.052	619,026	0.9911	-0.25%	0.902%
6	3922.42	3955.13	5000	4.1640	200.00	15.959	819,702	0.9917	-0.18%	0.834%
7	4938.06	4970.13	5000	4.9760	200.00	20.091	1,031,950	0.9935	0.00%	0.649%
8	246.58	248.38	5000	1.1986	201.19	1.003	51,531	0.9928	-0.07%	0.727%
9	776.15	777.00	5000	1.6215	200.00	3.158	162,199	0.9989	0.54%	0.109%
10	1304.13	1306.38	5000	2.0450	200.00	5.306	272,536	0.9983	0.48%	0.172%
11	1824.92	1838.88	5000	2.4710	200.00	7.425	381,369	0.9924	-0.11%	0.765%
12	2344.98	2362.63	5000	2.8900	200.00	9.541	490,051	0.9925	-0.10%	0.753%
13	2867.20	2888.88	5000	3.3110	200.00	11.666	599,184	0.9925	-0.10%	0.756%
14	3384.38	3412.63	5000	3.7300	200.00	13.770	707,263	0.9917	-0.18%	0.835%
15	3902.27	3931.38	5000	4.1450	200.00	15.877	815,493	0.9926	-0.09%	0.746%
This data was taken using the meter's mA output (Elbow 2 3D on Chart)										
1	245.11	246.75	5000	1.1973	202.40	0.997	51,223	0.9933	-0.02%	0.669%
2	986.19	989.75	5000	1.7917	200.00	4.013	206,093	0.9964	0.29%	0.361%
3	1969.50	1978.88	5000	2.5830	200.00	8.013	411,583	0.9953	0.18%	0.476%
4	2922.58	2947.63	5000	3.3580	200.00	11.891	610,758	0.9915	-0.20%	0.857%
5	3961.26	3997.63	5000	4.1980	200.00	16.117	827,819	0.9909	-0.26%	0.918%
This data was taken using the meter's mA output (Elbow 3 3D on Chart)										
1	245.18	246.38	5000	1.1970	202.34	0.998	51,238	0.9952	0.17%	0.487%
2	1000.58	1002.13	5000	1.8016	200.00	4.071	209,100	0.9985	0.50%	0.155%
3	1963.74	1976.38	5000	2.5810	200.00	7.990	410,381	0.9936	0.01%	0.643%
4	2980.85	3003.88	5000	3.4030	200.00	12.128	622,934	0.9923	-0.12%	0.773%
5	3961.98	3996.38	5000	4.1970	200.00	16.120	827,969	0.9914	-0.21%	0.868%
							Avg. coefficient :	**0.9935**	Avg. Dev :	**0.655%**
							Std. deviation :	**0.0025**		

Certified by:



Steven L. Barfuss P.E.
Research Professor

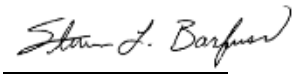
Table 3. Utah Water Research Laboratory Flow Meter Calibration Data

Manufacturer:	GWF		
Calibration Date:	10/30/25		
Calibration Location:	North and South test line	Meter Inlet Diameter (in.) =	10-inch
		Nominal Pipe Dia. =	10-inch
Serial Number:	25400142	Pipe Diameter (in.) =	10.020
Model Number:	EDGE	Pipe Area (ft2) =	0.55
		Water Temp. (F) =	41.3
Pipe Setup	Elbow Test	Unit Weight (lb/ft3) =	62.43
Upstream:	Zero inches of Straight Pipe	Kin. Visc. (ft2/s) =	1.63E-05
Downstream:	10 feet of Straight Pipe		

Calibration Performed by: M. Cannon
Calibration Witnessed by: none

Run No.	UWRL Flow (gpm)	Indicated Flow (gpm)	Meter Range (gpm)	Voltage Reading	Measurement Time (sec)	Pipe Velocity (fps)	Inlet Reynolds Number	C	Dev from mean C (%)	Dev of Flow (%)
1	2	3	4	5	6	7	8	9	10	11
This data was taken using the meter's mA output (Elbow 1 0D on Chart)										
1	123.07	124.88	5000	1.0998	204.47	0.501	25,719	0.9856	-0.32%	1.465%
2	246.85	249.88	5000	1.1998	200.97	1.004	51,587	0.9879	-0.08%	1.224%
3	972.53	982.63	5000	1.7860	200.00	3.957	203,237	0.9897	0.10%	1.039%
4	1963.02	1987.63	5000	2.5900	200.00	7.987	410,231	0.9876	-0.11%	1.253%
5	2943.44	2985.13	5000	3.3880	200.00	11.976	615,117	0.9860	-0.27%	1.416%
6	3905.15	3957.63	5000	4.1660	200.00	15.889	816,094	0.9867	-0.20%	1.344%
7	4921.52	4982.63	5000	4.9860	200.00	20.024	1,028,493	0.9877	-0.10%	1.242%
8	247.21	249.50	5000	1.1995	203.59	1.006	51,661	0.9908	0.21%	0.927%
9	769.68	775.63	5000	1.6204	200.00	3.132	160,846	0.9923	0.37%	0.773%
10	1269.60	1280.13	5000	2.0240	200.00	5.166	265,320	0.9918	0.31%	0.829%
11	1815.56	1836.38	5000	2.4690	200.00	7.387	379,415	0.9887	0.00%	1.146%
12	2370.15	2400.13	5000	2.9200	200.00	9.643	495,312	0.9875	-0.12%	1.264%
13	2821.16	2853.88	5000	3.2830	200.00	11.478	589,563	0.9885	-0.02%	1.160%
14	3407.40	3450.13	5000	3.7600	200.00	13.864	712,074	0.9876	-0.11%	1.254%
15	3891.49	3943.88	5000	4.1550	200.00	15.833	813,238	0.9867	-0.20%	1.346%
This data was taken using the meter's mA output (Elbow 2 0D on Chart)										
1	245.68	248.00	5000	1.1983	190.22	1.000	51,343	0.9907	0.20%	0.942%
2	994.82	1004.63	5000	1.8036	200.00	4.048	207,897	0.9902	0.16%	0.985%
3	1965.90	1987.63	5000	2.5900	200.00	7.999	410,832	0.9891	0.04%	1.105%
4	2965.02	3003.88	5000	3.4030	200.00	12.064	619,627	0.9871	-0.17%	1.310%
5	3967.73	4015.13	5000	4.2120	200.00	16.143	829,172	0.9882	-0.05%	1.194%
This data was taken using the meter's mA output (Elbow 3 0D on Chart)										
1	248.50	250.63	5000	1.2004	202.53	1.011	51,932	0.9915	0.29%	0.854%
2	978.28	986.13	5000	1.7888	200.00	3.980	204,440	0.9920	0.34%	0.802%
3	1946.48	1966.38	5000	2.5730	200.00	7.920	406,773	0.9899	0.12%	1.022%
4	2993.08	3032.63	5000	3.4260	200.00	12.178	625,490	0.9870	-0.18%	1.321%
5	3959.82	4013.88	5000	4.2110	200.00	16.111	827,518	0.9865	-0.22%	1.365%
							Avg. coefficient :	**0.9887**	Avg. Dev :	**1.143%**
							Std. deviation :	**0.0020**		

Certified by:



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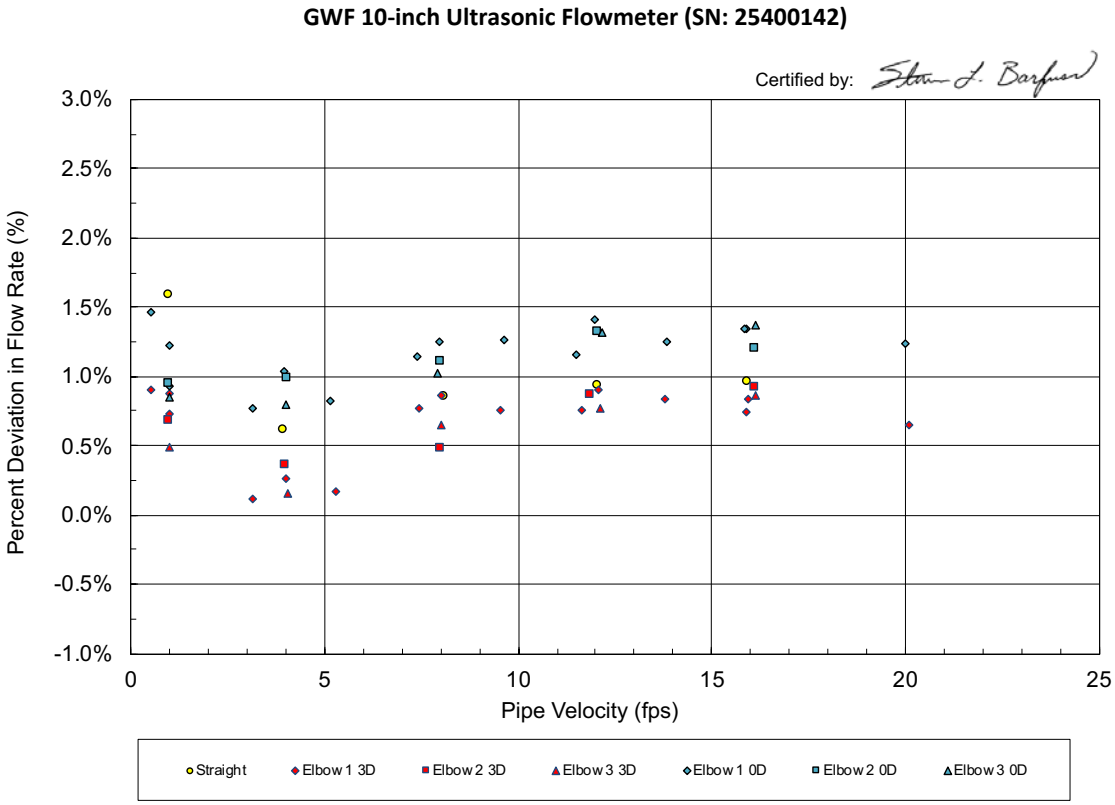

Figure 4. Pipe velocity vs % deviation of flow rate for GWF ultrasonic flow meter

Appendix

Meter Tag and Flow Meter Certification Submittal Form

v. 1.1 Feb 2019

Office Use
Test Date _____

IDAHO DEPARTMENT OF WATER RESOURCES

FLOW METER CERTIFICATION SUBMITTAL FORM

Complete one form for each meter model submitted

Submit this completed and signed form, along with a factory calibration curve for the tested meter, to the Idaho Department of Water Resources *prior to* the UWRL test date.

Meter Manufacturer: GWF AG

Meter Model Name: sonico EDGE

(model name to appear on IDWR's Approved List)

Manufacturer Representative: Contact Utah Water Research Laboratory (435-797-3214) five business days prior to testing if a manufacturer representative will be present during meter testing.

Name Thaddey Sergio — Relationship to Manufacturer Employee

Address Obergrundstrasse 119 — Phone +41 41 319 51 85

City Lucerne ST _____ Zip 6005 — E-mail sergio.thaddey@gwf.ch

Submitted Meter Information: ☐ Check here if installation of the meter(s) requires special fittings

Power Supply: *Primary input power required for transmitter/converter*

☐ **AC** ■ **DC** ☐ **Internal battery*** ☐ **DC & Internal battery**

Note: All meter power options of the same model must be tested separately. Meter models appearing on IDWR's List of Approved Closed Conduit Flow Meters are authorized for use only under the input power option(s) tested and passed in the lab.

Meter Type: *Select **only one** of the five available meter types*

☐ **Full-profile Electromagnetic** **OR** ■ **Spooled Ultrasonic**
(10" diameter required for testing)

Sensor Model No. 2SE2F — Sensor Serial No. 25400142

Available sensor sizes as of test date size 10" lay length 450mm

Transmitter/Converter Model No. N/A — Transmitter/Converter Serial No. N/A

Is converter available in a remote (field) mount option? ☐ Yes ■ No

☐ **Ultrasonic, Clamp On** **OR** ☐ **Ultrasonic, Wetted Transducer**

Meter Model No. _____ Meter Serial No. _____

Transducer Frequency (Mhz) _____ Transducer Serial No. _____

Meter Type, continued...

☐ **Small Diameter** **(Meters manufactured in 2" diameter and smaller *only.*)**

Meter Model No. _____

Size #1 (in) _____

Meter Serial Numbers (five total):

- _____
- _____
- _____
- _____
- _____

Size #2 (in) _____

Meter Serial Numbers (five total):

- _____
- _____
- _____
- _____
- _____

Meter Settings and Input Power during Laboratory Testing:

Sampling Mode*
Battery conservation = low sampling frequency — N/A

Calibration mode = high sampling frequency — N/A

Other _____

Power Supply
Specific meter input power supplied during testing (AC, DC, Battery voltage supplied) — 24V DC

Sampling Frequency
Samples per second — 4 Hz

Output Type
Analog (4-20 milliamp: provide full scale value) — 20mA = 20fps

Digital (pulse output: provide count/unit measured) — N/A

Meter Constant
Post-factory meter constant — 1 USGal/pulse

Factory or User Adjustable Meter Settings
Adjustable settings which can affect the meter battery life, accuracy or precision

none

Note:

* If the sole power supply for this flow meter is an internal battery and the meter manufacturer states the sampling mode to be used at the time of testing is "calibration mode", then the meter manufacturer must also state if this configuration is the factory standard setting. If this "internal battery/battery conservation" configuration it is not the factory standard setting, the flow meter must be tested in "battery conservation" mode.

Attachments and Signature:

Calibration Verification

Each meter submitted for testing shall not be calibrated beyond normal factory default calibrations. Each model must have a factory calibration curve submitted.

I certify that the meter(s) identified above submitted for the Idaho Department of Water Resources testing at Utah Water Research Laboratory is a representative sample of the model manufactured and sold to end users and has not been calibrated beyond normal factory default calibrations for this manufacturer.

STH *initials*

Sergio Thaddey
Manufacturer Representative Name (Print)

Manufacturer Representative Signature

12.11.2025
Date

Release of Test Results by UWRL

Utah State University's Utah Water Research Laboratory (UWRL), upon completion of laboratory testing of the flow meter(s) identified above, and pursuant to criteria specified by the Idaho Department of Water Resources (IDWR), will produce a written report of test results. This report will be used by IDWR to determine placement on IDWR's Approved Flow Meter List, in accordance with IDWR's Minimum Acceptable Standards for Open Channel and Closed Conduit Measuring Devices.

I give the UWRL permission to release a written report of test results to IDWR pursuant to IDWR's testing criteria for flow meters and the meter identified above.

STH *initials*

Submit this form and attachments to:

Idaho Department of Water Resources
c/o Brian Ragan
PO Box 83720
Boise, ID 83702-0098

OR email to:
brian.ragan@idwr.idaho.gov
Phone: 208-287-4800

A copy of this form and all attachments should accompany the meters submitted for testing. Meters must be shipped to Utah Water Research Laboratory, 1600 Canyon Rd, Logan UT 84321