Low Flow-Rate Measurements

The Division recommends using a pipe flowmeter for measuring low flow rates. However a bucket and stopwatch is a simple and accurate alternative to measure flow rates when pipe flows are *constant*. The method is useful for low-flow diversions, gravity springs or small pumps under stable conditions and can also be used to confirm the calibration of existing flowmeters. A five gallon bucket is useful for diversions up to 50 GPM. At least three trials should be conducted and averaged. To measure the flow rate using the bucket method:

1. Measure the volume of a 5 gallon bucket or other container.
2. With a stopwatch, time how long it takes the pump to fill the bucket with water. Start the stopwatch simultaneously with the start of the bucket being filled and stop the stopwatch when the bucket fills.
3. Record the time it takes to fill the bucket.
4. Repeat the above steps at least three times and take the average. It is a good idea to do a few trial runs before recording any data so that one can get a feel for the timing and measurements required.
5. The flow rate is the volume of the bucket divided by the average time it took to fill the bucket.
6. Here is an example:

$$t = \frac{11.2s + 13s + 13.5s}{3} = 12.6\ seconds \qquad Q(flow\ rate) = \frac{V}{t} = \frac{5\ gallons}{12.6\ seconds} = 0.40\ \frac{gal}{s}$$

So the flow rate is 0.40 gallons/second or Q = (0.40 gal/sec) x (60 sec/min) = 24 gallons/minute.

If water levels change throughout the season, flow-rates should be re-calibrated under each condition. For example, if you are pumping uphill into a tank or reservoir, the suction lift will increase as the river level drops and the input power to the pump will increase. A good check to determine if the pump is consistently producing the calculated flow rate is to note any changes in your electricity records over time.