STANDARD OPERATING PROCEDURE
Water Level Measurement in a Well

KEY WORDS

Groundwater, water, well, level, measurement

APPROVALS

Original signed by 11/28/2023
MANAGEMENT: _____ DATE: _____
Joy Dias
Groundwater Protection Program, Environmental Program Manager

Original signed by 11/30/2023
SENIOR SCIENTIST: _____ DATE: _____
Tiffany Kocis Richardson
Groundwater Protection Program, Senior Environmental Scientist (Specialist)

Original signed by 11/30/2023
QUALITY ASSURANCE: _____ DATE: _____
Vaneet Aggarwal, Ph.D.
Environmental Monitoring Branch, Senior Environmental Scientist (Specialist, QA Officer)

Original signed by 11/28/2023
AUTHOR/PREPARED BY: _____ DATE: _____
Galen Wing
Groundwater Protection Program, Scientific Aid

Environmental Monitoring Branch organization and personnel, such as management, senior scientist, quality assurance officer, project leader, etc., are defined and discussed in Standard Operating Procedure (SOP) ADMN002.

No previous authors.

1.0 INTRODUCTION

1.1 Purpose

This document instructs users to properly measure the depth of water in a groundwater well, referred to as a water level measurement, using a sonic water level meter or water level indicator.

1.2 Scope

The instructions contained in this document apply to all Groundwater Protection Program staff that need to measure the water level in wells while conducting fieldwork as listed in section 3.5 in FSWA001.04.

2.0 MATERIALS

2.1 Materials for Ravensgate M200 Sonic Water Level Meter (SWLM)

2.1.1 Ravensgate M200 SWLM

2.1.2 Spare AA Batteries

2.1.3 Nitrile Gloves

2.1.4 Phillips head screwdriver

2.2 Materials for DGSI Water Level Indicator (WLI)

2.2.1 DGSI WLI

2.2.2 Spare AA Batteries

2.2.3 Nitrile Gloves

2.2.4 Wide, flathead screwdriver or a coin

3.0 PROCEDURES

3.1 Identification of suitable wellhead

3.1.1 Ensure that proper preliminary steps have been completed in accordance with SOP FSWA001.04 for obtaining permission to sample the well before performing water level measurement. Always wear gloves when collecting measurements.

3.1.2 Only take a water level measurement when the pump is not running, ideally, if it has not been turned on for that day. To maximize this likelihood, measure the static water level in the morning before the water has been turned on for the day. If that is not an option, take the water level measurement, at a minimum, before purging the well when the well is not running. If the well has been running recently or is currently running, make note of this in the well information sheet comment section.

3.1.3 Identify the top of the well casing (Figure 1). Standard wells will have a port (hole) on the top of the casing head (Figure 2). This port is usually closed with a plug, which can be made of plastic or metal.

3.1.4 Remove the plug. These plugs can become weathered, brittle, stuck, or rusted due to exposure to the elements. If the plug cannot be easily removed, or you are concerned that removing the plug will damage it, do not remove the plug.

3.1.5 Both the SWLM and the WLI cannot be used if the test port is less than 5/8 inches (16mm) in diameter.

Figure 1: The well casing is the six-inch steel pipe that is slightly rusted.

Figure 2: Test port on the casing cap

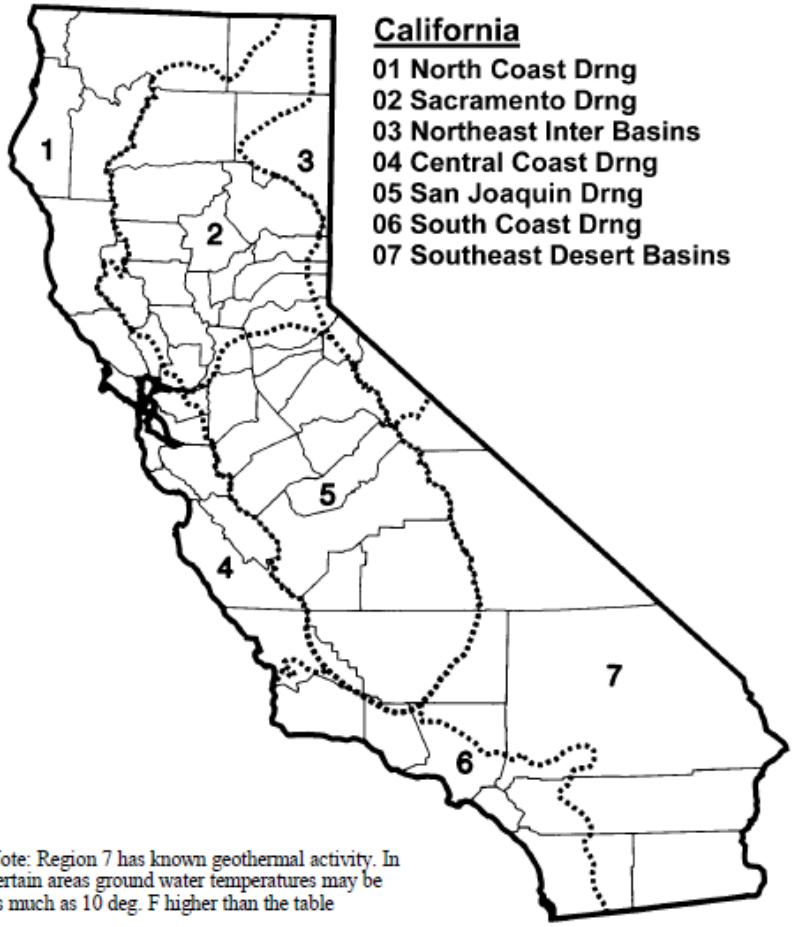
3.2 Taking measurements with the SWLM

3.2.1 Ensure that the SWLM is functional before taking a measurement. To do this, press the red **[On/Off]** button on the front of the device. If the device does not turn on, or the LCD reads "low battery," see section 3.4.

3.2.2 Set the reference temperature with appropriate toggle button. There is a map in the case for the SWLM with the correct reference temperatures based on location and month. A copy of this map is shown in Figure 3.

3.2.3 Set the water level to either DEEP or NORMAL via the DEPTH SWITCH. NORMAL is used for static water levels between 10 and 500 ft, while use the DEEP setting only for water levels deeper than 200 feet.

Regional Map and Table of Monthly Temperature Settings for
CALIFORNIA



Note: Region 7 has known geothermal activity. In certain areas ground water temperatures may be as much as 10 deg. F higher than the table

Region	Temperature Control Setting For Month of:											
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	53	53	54	55	55	56	57	57	56	55	54	53
2	54	54	55	55	57	58	58	58	58	56	55	54
3	42	43	43	45	47	47	49	48	47	45	44	43
4	57	57	57	58	58	59	59	59	59	58	57	57
5	58	58	59	59	61	62	63	62	62	60	59	58
6	60	60	60	61	61	62	63	63	62	62	60	60
7	62	63	64	65	66	67	68	68	67	65	64	62

Figure 3. Regional map and table of monthly temperature settings for California for the SWLM.

3.2.4 Remove the red cap from the end of the probe and position the instrument over the well cap with the probe inside the port (Figure 4). Sometimes, the rubber seal in the well cap can be misaligned, obscuring the hole. If the hole is mostly open, try to wiggle the probe into the port. The end of the probe screen must not be obstructed. If it is obstructed, the SWLM will return an erroneously low value.

Figure 4: Left - Placement of the SWLM into the test port; Right - LCD screen reading of water level measurement.

3.2.5 Press the red **[On/Off]** button to take the measurement. The LCD screen will display the temperature and the measured water level after 5-15 seconds, depending if the setting is on DEEP or NORMAL.

3.2.6 Record the displayed water level depth on the well information sheet. If the depth seems off from what was expected, check that the initial temperature and depth settings are correct, and check to ensure that the end of the probe is not obstructed. If present and knowledgeable, the resident can also be a helpful resource to check the number against.

3.2.7 Replace the cap on the meter and the plug on the well. If plug does not fit flush, replace with a new plug from the tool kit.

3.2.8 Clean the sonic water level reader according to FSWA018 upon return to the warehouse.

3.3 Taking measurements with the WLI

3.3.1 Set the sensitivity control dial to a 5 or 6. The sensitivity may need to be lower for more conductive water and higher for more resistive water.

3.3.2 Use test button to confirm unit is operational. If there is no sound when pressing the test button see section 3.5.

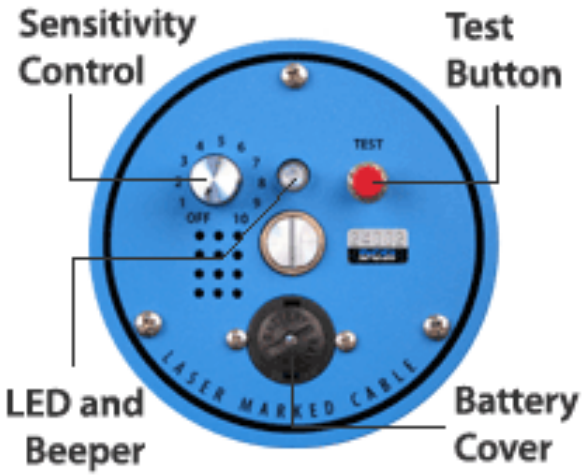


Figure 5: Water Level Indicator (WLI)[1]

3.3.3 Ensure the WLI is secure -- either by another person holding it or by anchoring it against the side of the test port.

3.3.4 Lower the steel probe on the end of the WLI cable through the test port into the well casing. Slowly lower the probe until the beeper sounds. If the probe touches the water and there is no beep, troubleshoot by adjusting the sensitivity as described in section 3.3.1.

[1] Used with permission from Durham-Geo Enterprises, Inc. https://durhamgeo.com/products/water-level-indicators/

Figure 6: Probe and Cable

3.3.5 Read the level indicated on the cable where it meets the wellhead. This is the water level in the well. Record this measurement on the well information sheet.

Figure 7: Cable Notches

3.3.6 Slowly withdraw cable from well, respooling the cable as it is removed.

3.3.7 Replace the plug on the well. If the plug does not fit flush, replace with a new plug from the tool kit.

3.3.8 Clean the probe with DI water according to FSWA018 before proceeding to the next well.

3.4 Maintenance and Troubleshooting for the SWLM

3.4.1 If the device does not turn on, or the LCD reads “low battery,” then try replacing the batteries.

3.4.2 Open the reader by unscrewing the six screws on the front of the cover.

3.4.3 Remove the cover on the front of the SWLM, ensuring the wires connected to it are not damaged.

3.4.4 Pop out the battery case and replace the batteries with AA ensuring they are correctly aligned.

3.4.5 Reinsert the battery box and screw the face of the SWLM back on.

3.4.6 Press the red button on the front to ensure the SWLM is working, and the battery indication warning is gone.

3.4.7 Contact the manufacturer, Ravensgate, to resolve further issues.

3.5 Maintenance and Troubleshooting for the WLI

3.5.1 If no sound is heard when pressing the test button, the batteries may need to be replaced.

3.5.2 Unscrew the battery cover using a wide, flathead screwdriver or a coin.

3.5.3 Remove old batteries and replace with new AA batteries.

3.5.4 Replace the battery cover.

3.5.5 Contact the manufacturer, Durham Geo-Enterprises, Inc. to resolve further issues.