Making and Using an Electric Sounder to Monitor Water Wells

By measuring the water levels in your well(s) once per month it is possible to identify potential water shortages long before they become serious problems. From the measurements you can determine what are regular seasonal changes and what are problems caused by over pumping, well screen or slotted casing plugging, or reduced groundwater recharge resulting from drought, land clearing or surface drainage.

The following is a practical low cost method to measure well water levels. Depending on the well depth and the desired sophistication, material costs will range from $40 to $80 compared to $400 plus for purchasing a well sounder.

How to measure the water level:

- Carefully remove the well cap and lower the electric sounder cable into the well until the signal device indicates a closed circuit has occurred (when the probe and sensor touch the water).

- Consider suspending the cable in the well for a series of readings to reduce errors from kinks or bends. A reel will help prevent such problems and maintain a smooth cable. Take care when lowering and raising the cable to help maintain an accurate measuring device and prevent jamming of the electric cable in the well.

- If the electric cable is not marked use a clamp or marking device to establish the point when the signal sounds. **Measure the change in water level along the electrical cable from the marked point to the end of the cable (probe) where the sensor contacts the water.** Depth markers can be added along the length of the tape as reference marks to simplify measurements. Set metal clips or heat shrink tubing at five to ten foot or one meter graduations. If flat cable is used, mark a depth scale using a permanent marker. Periodically check that the markers have not moved. Be consistent and take care to get correct measurements.

- **Accuracy is important.**

- **It is also important to prevent loss of equipment inside the well.** Make sure all fittings and weights are secure (including any portable tools).

- **Keep equipment clean to prevent well contamination.** Disinfect with chlorine solution to avoid cross-contamination (iron bacteria) between different wells.

Figure 1 Electric Well Sounder

Custom-make the electric sounder to your specific situation. The total length of the sounder cable is from ground surface (usually top of the well casing) down to the pump level.
Material List

**Reel Mechanism:** Home-built or commercial electric cord-reel, recommended for easier operation and to protect the electrical cable from bending and kinking.

**Energy Supply:** Two 9 volt batteries connected in a series to provide 18 volt power supply.

**Signal device:** Radio shack 273-060B Piezo Buzzer (4 to 28 volt, 5 mA maximum current consumption at 12 VDC), or light or ammeter.

**Electric Cable:** Soft and flexible two-wire cable, 16 gauge is acceptable, including flat TV Cable. Length depends on pump depth.

**Weighted Probe:** Metal piece (approx. ½ inch x 12 inch steel rod) of sufficient weight to suspend the cable, heat shrink tape and plastic probe protector tube. (See detail below)

**Weight:** Steel rod (½ inch x 12 inch)

**Protector Tube:** Plastic tubing (½ inch x 3 inch) placed over contact points to prevent it from touching the casing. Also drill a vent hole in side of the tube to vent air and/or release water from the tube.

**Contact Point:** End of the two-wire cable. Stagger ends (approx. ¼ inch) and solder to prevent fraying.

**Accessories:** Adjustable wrench to remove the well cap, and a measuring tape to establish water depth.

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**Construction Cost**

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric Cable</td>
<td>Cost $15 to $25 per 100 feet.</td>
</tr>
<tr>
<td>Energy Source</td>
<td>Depends on desired quality – Cost $2 to $5</td>
</tr>
<tr>
<td>Signal Device</td>
<td>Depends on device used (buzzer, light or ammeter) – Cost $2 to $10</td>
</tr>
<tr>
<td>Weighted Probe</td>
<td>Cost is $5 to $10.</td>
</tr>
<tr>
<td>Reel Assembly</td>
<td>Cost for reel is less than $20</td>
</tr>
<tr>
<td>Accessories</td>
<td>Cost less than $10</td>
</tr>
</tbody>
</table>
Water well sounders are also available for use from local well drillers and for purchase from the following companies:

Canadian Forestry Equipment
17854 – 106 A Ave
Edmonton, AB
1-877-233-2255
(780) 484-6687
www.cfe.ca

Mow-Tech Ltd.
10704 – 181 Street
Edmonton, AB
(780) 484-6356

Solinst Canada Ltd.
35 Todd Rd.
Georgetown, ON
1-800-661-2023
www.solinst.com

Interpreting Well Monitoring Results

The Non-pumping (Static) Water Level is the level of water in a well that is not being affected by withdrawal of groundwater. Monitoring this water level allows you to assess whether the aquifer is sustainable at a specific pumping rate. Non-pumping (static) water levels are best recorded before the pump is turned on and after the water level in the well has been allowed to fully recover.

- A good time to take a non-pumping reading is first thing in the morning before there has been any water use. Monitoring on a regular basis, for example every week on the same morning, will give you consistent data that allows for better interpretation of results.

- Change in water level can occur naturally due to seasonal fluctuations. For example, shallow well water levels are usually highest in June or July and gradually decline in late September or October. Deep wells of 60 - 90 m (200 - 300 ft.) do not experience seasonal fluctuations like shallow wells.

- If there is no significant change in the non-pumping water level, full recovery is occurring. The aquifer is supplying water to the well at the rate you have been pumping.

- If the non-pumping water level is continuously dropping, full recovery is not occurring. The aquifer is not supplying water to the well at the rate you have been pumping. You need to reduce the amount of water being withdrawn from the well. Take additional measurements to see if the water level is recovering. If you find that the water level begins to rise again, you have previously been over-pumping your well. A flow meter can also be a beneficial installation to help monitor well output.

- If the water level does not show signs of recovery after continued monitoring, you will need to further reduce water use from the monitored well and look for other supplementary water supply options.

Aquifer depletion may also be regional. Other water users may be impacting the same aquifer you are relying on. This is another important reason for all water users to monitor their wells.
The Pumping Water Level is the level at which water stands in a well when pumping is in progress. Record the pumping water level while the pump is operating. If you take several readings over time, you will have data that can help you assess the efficiency of the well.

- When you take pumping water level measurements, you need to be consistent when measurements are taken. For example, you might take the measurement after the pump has been on for 2 hours. Being consistent allows you to compare the readings (See Figure 2).

- A good time to take a pumping water level reading is during the day when the pump is pumping, for example, at noon. By then there has been significant water use. Taking the reading at the same time of day will give you comparable water levels, unless water use varies considerably between seasons.

- Pumping water level readings that are relatively constant indicate that well efficiency is remaining relatively constant.

- If the original non-pumping water level is remaining constant, but the pumping water level is declining something is causing the well efficiency to decline. The screen (or slotted casing) may be plugged with sand, bacterial growth or mineral incrustation.

Even when the pumping water level remains relatively steady, you need to do regular annual maintenance, including shock chlorination, to control bacteria buildup. If you allow a well to deteriorate for too long, it may not be possible to restore its original capacity. Consult with a drilling contractor to determine exactly what is causing the reduced efficiency of the well and to correct the problem.

Refer to the publication “Water Wells that Last for Generations” for monitoring worksheets and additional information on water wells. Contact Alberta Agriculture toll free at 310-0000 and (780) 422-5000 to obtain a printed version. You can view this publication on the Alberta Agriculture Food and Rural Development Website: http://www.agric.gov.ab.ca/wate/wells/index.html.