

Water Monitoring Program  
**WASHINGTON CONSERVATION DISTRICT  
STANDARD OPERATING PROCEDURE (S.O.P.) No. 1**

**GROUNDWATER MONITORING**

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## **1.0 SCOPE AND APPLICABILITY**

### **.1 Overview of Groundwater Monitoring Procedures**

This S.O.P is designed to define the procedures that are performed in groundwater monitoring to ensure the accuracy and usability of the data after the raw data has been collected. Multiple agencies collect these types of data and have specific standard procedures for their specific data collection needs. This S.O.P. specifically defines the methods used by the Washington Conservation District (WCD) and does not reflect the exact procedures used by others. Although other agency S.O.P.'s may look similar, careful investigation may reveal differences between procedures that should be taken into account.

### **.2 Scope of the S.O.P.**

This SOP describes required procedures for groundwater monitoring. This SOP describes:

- Field data collection
- Data logger data collection
- Data compilation and management

## **2.0 EQUIPMENT AND MATERIALS**

The following equipment and materials will be required:

- Field log book or electronic field log book
- Electronic Well Sounder or Steel Tape with Chalk
- Laptop computer
- Desktop computer
- Connection to network server
- Software
  - Microsoft Office software products (Word, Access, Excel)
  - Global Water or similar level logger software
  - Pendragon Forms 5.0

## **3.0 PROCEDURES**

### **.1 Procedure for field data collection**

#### **.1.1 Static well manual elevation measurements**

At least every 30 days, site visits will be performed to take a measurement of static well water elevations in our monitoring well network. If field personal can't locate a well visually, a GPS device will be used to locate the coordinates of the well. Once at the monitoring well, field personnel will record the date, time, unique well identification number from the well, the measuring point from which the personnel will take the reading, and any other nearby activities that could be affecting groundwater elevations (i.e. irrigation, pump tests, etc.). Personnel will then remove the cap from the well and lower either an electric sounder or a pre-chalked steel tape.

The water level device used will be lowered until it either sounds (electric sounder) or is lowered to a pre-determined depth. The electric sounder will be pulled up and down numerous times in order to ensure that they have found the water surface. The tape user will pre-determine the amount that he or she will lower the tape by looking at the previous reading taken and using that as a starting point for how much the tape will be lowered. A 5-10 ft. span will be chalked surrounding the pre-determined elevation. If no water is detected on the tape using a 5-10 ft. chalked span a 10-20 ft. chalked span will be lowered. Once either the sounder or the tape has found the water surface, the data must be recorded in the field data log book or electronic log book. For the sounder, record the length from the measuring point to the sounding sensor (most have pre-measured rules on them already). For the tape, measure the distance to the wetted point on the chalk. Record these values in the log book for later data translation.

#### **.1.2 Procedure for Data logger data collection**

At least every 14 days, site visits will performed to ensure the integrity of the monitoring site and its data. If field personal can't locate a well visually, a GPS device will be used to locate the coordinates of the well. Once at the monitoring well, field personnel will record the date, time, unique well identification number from the well, the measuring point from which the personnel will take the manual reading, the data logger that is being downloaded, any data logger data that looks strange or wrong, and any other nearby activities that could be affecting groundwater elevations (i.e. irrigation, pump tests, etc.).

Personnel will remove the cap from the well and connect the data logger to the laptop computer. The data logger will be downloaded and the data will be stored in the laptop until it is backed up to a network server in the office. Once downloaded, look at the data to ensure the data looks

accurate. If something appears strange or incorrect, a note will be made in the log book and it will be further examined in the office. Once the data logger has been downloaded, a manual static water elevation measurement will need to be taken. See procedure above for protocol of static water elevation measurement. The reason a manual measurement is taken is because the manual measurement and continuous data should have the same offset between values of measurement throughout the monitoring season and if they don't the data logger data may be incorrect.

### **.1.3 Procedure of Data Compilation and Management**

With field data collected, the process of data compilation and management must be performed in the office.

For manual static water elevation measurements, the data collected in the field log book or electronic log book will be transferred to a desktop computer's spreadsheet program. Once in the spreadsheet, the data can be saved to the network server for more permanent storage. The groundwater elevation above mean sea level (MSL) is determined by subtracting the measurement taken in the field by the elevation of a known point on the surface or the measuring point. This point will either have an elevation assigned to it that is determined by an accurate survey or will utilize an assumed elevation (i.e. 100). A graph should be generated to view the data in order to determine if any reading seems wrong or strange. If anything seems wrong a note should be made to flag this data point and a subsequent measurement may need to be made to verify this measurement. This information will then be recorded in the spreadsheet and saved to the network server.

For data logger data elevation measurements, the data collected in the field log book or electronic log book will be transferred to a desktop computer's spreadsheet program. Once in the spreadsheet, the data can be saved to the network server for more permanent storage. See the procedure above to determine water elevations for manual measurement. The data logger information should be saved to the network server during normal data backup procedures (see WCD S.O.P. 1 Data Management). To compile and manage the data logger data, the data should be plotted on a graph within a spreadsheet. If any data points seem strange or wrong, a note will be recorded by that data point or points. All manual elevations recorded during site visits should also be recorded within the spreadsheet to match the date and time of the data logger data. An offset should be determined between the data logger data and the manual elevation measurement. The offset should be the same or within 0.02 or 0.03 ft. for each measurement. If there are measurements outside this range, then a note should be made indicating the data may be inaccurate. If it is determined from the data that the data logger may be malfunctioning, then the data logger should be pulled from the site and sent in for recalibration or repair. Once all of the data logger data and manual measurements are compiled, then the elevation of the water must be translated to the data logger data. Data logger data is not in elevation MSL. The data logger simply measures the depth of water with which it is submerged in. To translate this data into

elevation MSL, the offset determined between data logger measurement and the manual measurement elevation should be added to the measurement by the data logger. Perform this operation on every data logger data point and you'll have continuous elevation data. This information should be recorded in the spreadsheet and saved to the network server.