

Sampling Method/Media: <b>Static Water Level Measurement /          Groundwater</b>	Title: <b>Standard Operating Procedure for          Measurement of Static Water Level</b>
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### 1. Introduction and Scope

This Standard Operating Procedure (SOP) provides operating guidelines and instruction for the measurement of water levels in standard groundwater monitoring wells. Standard groundwater monitoring wells are described as those constructed of PVC well pipes installed in boreholes with a sand pack around the well screen. Water levels are measured to determine groundwater elevations and flow directions, estimate the volume of water in a well for development or purging purposes, and to assess the hydraulic properties of the formation during hydraulic testing.

This SOP forms part of the British Columbia Field Sampling Manual (BCFSM). Additional information on static water level monitoring is provided in Part E2 – Groundwater, which must be used in conjunction with the information provided in this SOP. Further guidance regarding groundwater is provided in the Water Sustainability Act (WSA) and the Groundwater Protection Regulation (GPR) which are available at:

<https://www2.gov.bc.ca/gov/content/environment/air-land-water/water/laws-rules/groundwater-protection-regulation>.

The Environmental Management Act (EMA), the Contaminated Sites Regulation (CSR) and associated guidance documents provide information specific to groundwater monitoring wells installed to investigate and remediate contaminated sites; these documents are available at:

<https://www2.gov.bc.ca/gov/content/environment/air-land-water/site-remediation/contaminated-sites>.

Groundwater well installations, sampling, monitoring and decommissioning conducted for regulatory purposes within the provincial jurisdiction of BC must be carried out with consideration to the WSA, the GPR, the EMA, and the CSR, all as applicable, Part E2 of the BC Field Sampling Manual, and this document.

### 2. Document Control

This Standard Operating Procedure (SOP) is a controlled document. Document control provides a measure of assurance that the specifications and guidance it provides are based on current information that has been scrutinized by a qualified reviewer/s. Controlled documents are reviewed within a five year life cycle. Please ensure that the revision date listed in the header of this document does not exceed five years.

### 3. Principle of Measurement of Static Water Level

Water levels are used to assess hydraulic gradients, groundwater flow direction, and the volume of water in a well which may require purging prior to groundwater sampling. Water levels should generally be monitored before wells are pumped or sampled to ensure static (equilibrium) groundwater conditions are known and recorded. The collection of static water levels in monitoring wells should generally be monitored in as short a time frame as practicable to minimise atmospheric influence. Water levels should be carried out in a predetermined order beginning with background locations and working toward known or suspected areas of impact to minimise the potential for cross-contamination.

### 4. Quality Control

1. Ensure the water level probe and tape have been decontaminated prior to use. Inspect the tape to ensure

has not been damaged during previous deployments.

2. The most recent historical water level data should be available and checked at the time of the water level measurement. If a new measurement varies by more than 30 cm from the last reading, the measurement should be repeated so that the same reading is confirmed three times. This also ensures that pressure in the well is not affecting water levels (i.e., are stable).
3. Measurements should be made from the surveyed reference point on the well, usually the top of the well pipe.
4. Always monitor clean wells prior to measuring wells which may contain contaminants.
5. Check the tape length of the water level probe periodically (every six months) for accuracy and possible stretching.
6. Prior to arriving at the site, ensure that the water level probe is working and is the correct length for the wells to be monitored.

## 5. Recommended Equipment and Materials

For the measurement of static water level, the following equipment is required:

- Metal detector to locate flush-to-ground wells, if site is unpaved or if there is the potential for snow or ice;
- Tools to remove casing cover and monitoring well cap;
- Syringe or similar tool to remove standing water from within the casing;
- Water level probe;
- Water interface probe, as required;
- Organic vapour meter (OVM), as required;
- Dissolved oxygen meter, as required;
- Cleaning solutions and spray bottle;
- Paper towel;
- Previous monitoring records and site plan;
- Notebook; and
- Disposable gloves.

## 6. Static Water Level Measuring Considerations

- Water level probes operate by conducting current through electrolyte-containing water; the probe will not sound in deionized water (do not test a probe's functionality in de-ionized water).
- Protect the water level tape from abrasion against the well casing, etc. Exposed wires may cause the instrument to malfunction.
- Avoid using water level tapes that are used for contaminated site work in potable water wells.

## 7. Procedures

- 1) *Inspect the monitoring well*; identify the well and inspect it for damage. Inspect the surface seal, casing protector, stick up, protective guards, gasket seals, well caps, and vents. Check for flooding and record damage/deficiencies and general observations in the field notes. If the well is flush mounted and is flooded, the standing water in the road box must be drained prior to opening the well cap.
- 2) *Remove the well cap and measure head space vapours with an OVM*. Head space vapours must be conducted immediately upon removal of the well cap to prevent loss of vapours. If sampling equipment is present within the well, it should be left in place, if possible, until water vapour measurements are completed. If "in situ" measurements of dissolved oxygen are required, do this after measuring the well's static water level and depth to bottom.
- 3) *Identify the monitoring well's benchmark*; benchmarks are typically located at the top of the monitoring well's standpipe and are usually marked with indelible ink. If a benchmark is not present or identifiable, use the highest point on the monitoring well's standpipe. Clearly mark the benchmark (reference point) used for the measurements and record this information in your field log.

- 4) *Prior to placing the water level probe into the well; clean all debris and contaminants from the probe and water level meter tape using a mild phosphate-free detergent followed by a triple rinse with clean water. If light non-aqueous phase liquid (LNAPL) is known or suspected to be present, use an interface probe rather than a water level meter to measure the LNAPL thickness and water level.*
- 5) *If wells are known or suspected to have water levels above the well screen; allow the well to equilibrate with the atmosphere after removing the well cap (repeated water levels may be required to ensure equilibrium is reached).*
- 6) *Press the “test button” on the water level meter to ensure it is working, then lower water level probe into the well. Lower the probe slowly and record the depth at which the water level alarm sounds. Take the reading from the benchmark (reference point) on the standpipe and record the depth to the nearest 0.5 cm. The alarm should be clear and sharp; if it is intermittent, then the sensitivity of the probe likely requires adjusting as condensation in the casing may be activating the alarm.*
- 7) *Record the depth to water and time of measurement in the field notebook or logging sheet and re-check the depth at least once within approximately 10 to 20 seconds to ensure the water level is static and not moving. If successive readings are not within 0.5 cm, then continue measuring until successive readings are within 0.5 cm. Rapidly changing water levels may indicate a nearby pump is or was active or be indicative of depressurization following well cap removal. It is important to note that if water level measurements are being conducted during hydraulic tests, such as a pumping test, water levels may never be static. Because water levels will change with time during such tests, it is critical to have the time recorded with water levels during hydraulic testing. Refer to the relevant SOP for hydraulic testing guidance.*
- 8) *Measure and record the depth to the bottom of the well relative to the same reference point on the standpipe (referred to as “sounding”). Note that the bottom of the probe may be several centimeters below the water level sensor (i.e., what the tape length is calibrated to) and if so the extra probe length must be added to the well depth measurement. Sounding information may be useful for assessing whether sediments have accumulated in the well or for distinguishing wells in a multi-level well cluster.*
- 9) *Clean the water level tape and probe as it is retrieved from the well, using a phosphate-free liquid detergent followed by a clean water (distilled or clean tap water) rinse. Ensure the cleaning solutions do not enter the well.*
- 10) *Water levels and well depths should be compared to previous measurements/logs while in the field to identify trends, anomalies, and/or potential errors.*
- 11) *Monitoring of all wells should be completed within 12 hours to provide approximately synchronous data. If the site is too large for all wells to be monitored on the same day, efforts should be made to monitor all wells completed in the same water-bearing unit within 12 hours.*
- 12) *Record any significant changes of weather and other elements that may influence groundwater levels (e.g., pumping wells, tides, river levels near dams).*

## 8. References

1. ASTM D4750-87, 2001. Standard Test Method for Determining Subsurface Liquid Levels in a Borehole or Monitoring Well (Observation Well) (Withdrawn 2010), ASTM International, West Conshohocken, PA.
2. Nielsen, D.M., *Environmental Site Characterization and Ground-Water Monitoring*, CRC Press, 2006.

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**Approval**