

DQM Standard Operating Procedure (SOP) 9.2.1.1 (V2)

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Use of the DQM Field Data Sheet for Water Quality Monitoring**1.0 About this SOP**

This standard operating procedure (SOP) provides instructions for entering information and data into selected cells and boxes within the formal Field Data Sheet provided as part of the SOP. It has been developed as part of the Data Quality Management (DQM) System implemented by the Clean Water Team (CWT) to support collection of reliable data of known quality in a fully documented, scientifically defensible manner. The guidance in this SOP augments instrument-specific guidance that has been provided elsewhere (in the appropriate SOPs) by the CWT. The current version of this SOP is focused on measurements of temperature, dissolved oxygen, conductivity, pH, and transparency or turbidity in the field, with kits and instruments commonly used by citizen monitoring groups.

This SOP has been written for you, the Field Operator who conducts measurements, calibrations, and accuracy checks in the field. It also supports Projects where you also collect and dispatch samples for analysis off-site. In addition to the sampling and testing equipment, make sure you have the hardcopies of instrument-specific SOPs for all the kits and instruments you use (For example, SOP for the conductivity meter).

2.0 Generic Instructions for use of the “DQM Field Data Sheet for Water Quality Monitoring”.

These instructions pertain to the data sheet shown at the end of the SOP. Please make many copies of the Data Sheet for use in the field, and keep “spare copies” in ample supply. The datasheet has placeholders for observations, measurements, and sampling conducted at a station per one visit; a new sheet is used for each station visit. Some parameters and associated units have been provided in this generic data sheet; your Trainer or Technical Leader may tailor the datasheet to your group’s monitoring needs with more specificity, and may fill in some of the information you are asked to write in the instructions below. Although blank boxes are acceptable, please try to fill out all boxes in all fields. Enter “nap” if the box is Not Applicable to your situation. Enter “not tested” if you could not do the measurement or observation (and please remember that no data is better than bad data). The data sheet itself contains some clarification and instructions; these are printed in *italics*.

2.1 Top of the Page: Identifiers and other information

WRITE the water body name (creek, river, lake, beach, etc.); Project information, group name, and team members in the placeholders at the **top left side** of the page.

WRITE the Date, Station ID, and Station name on the **right side**, and circle the appropriate Station habitat. If you keep a sequence of your monitoring trips, write the unique Trip ID (this ID has to be unique to the entire monitoring Project). If you keep track of Station Visits, write the Station Visit ID. Use additional sheets if you visit the same station more than once in a Trip or a monitoring day, or if you visit other Stations on the same day. In other words, always use a new sheet for each new station visit.

WRITE the page number (top right corner) on each sheet in the sequence you used them, and – at the end of the day – add the count of the total number of sheets on each page (Example: fill in “Page 1 of 3” if you used out three sheets, i.e., had three visits to stations, during the Date indicated above).

WRITE the name of the monitoring team leader and the names of the other team members; use the back of the sheet for more names if needed. It is important to have at least one phone number to contact if someone has questions about the data.

WRITE the date of the last rain (not today’s date if it is raining). If you do not remember the exact date of the last rain, write how many days or weeks ago you think it occurred.

2.2 Observations box

Circle the word or phrase that best describes what you see. Add descriptors if relevant. If you also measure flow or wind speed (using an object or an Instrument and generating numerical Results), use the empty boxes at the bottom of the Measurements section below to report the your results as instructed below.

2.3 Measurements box

In this table, please complete one row for each Result. If you measure one parameter with more than one instrument (e.g., using both a pH strip and a pH electrode), fill in a new row at the bottom for that additional Instrument and measurement Result.

Instrument ID - fill in the unique Instrument ID as it is written on your instrument (for example, “DOW-STB3a”).

Parameter – The sheet already has a selection; you can add parameters at the bottom of that table if needed. The first Parameter row is for the Result of the Total depth at the Station, as measured with a marked pole or a similar portable device (note: this is different from the measurement depth requested in the Measurement

Table below, which is a descriptor and not a Result). If you have a staff gage installed near your Station you can use this row to record its reading, and enter the ID of that gage in the Instrument ID box. Remember that even relative elevations of water level (i.e., having a gage with an arbitrary zero) provide important information. If you cannot measure the total water depth at the Station during your Station visit, enter “not tested” in the Result box.

Note: The parameter “Specific conductivity” means that the electrical conductivity value has already been “corrected” for temperature effects, assuming that your instrument has built –in automatic temperature compensation (ATC) capability (most come with them now; check the instrument specification if you do not see “with ATC” written on the instrument itself).

Unit: Make sure the units are correct (change if needed).

Result - Write the result of each measurement in the appropriate row in the Result box. Check your instrument-specific SOP for the number of “significant digits”, i.e., how many digits in the Result have a number that is meaningful. In most cases three significant digits are fine, e.g., 10.4 mg/l DO (all three digits are significant) or 1560 uS (the first three are significant, the last one provides the order of magnitude but the difference between zero and, say, 2, is not significant). The resolution of your instruments is a good clue, for example the DO in the Winkler titration is reported to the nearest 0.2 mg/l, and the conductivity to the nearest 10 uS.

Repeated Measurement Result (2nd/rep/dup/dil): While the "Result" field is for the result of the first measurement with a given Instrument, this field is for additional results obtained with the same Instrument for the same station at the same time or immediately after the first. Write the new results in that box and add a code of what it represents, as follows:

- “2nd” is for repeated measurement if you are not sure the first measurement was done right or if the Result did not make sense (always repeat the measurement in these cases and record the 2nd in this field). If the second result confirms the first, leave both results in their boxes. However if you feel that the first measurement was not valid, cross the first Result out and write “invalid” near it in the Result box, and only the new (second) Result will be eventually used.
- “rep” is for replicate titration of the same fixed sample (in the Winkler DO measurement) or for a replicate test tube (with the same sample) for, e.g., ammonia. You can also use this box to record the perception of, e.g., the thermometer reading, by a second pair of eyes if different from the first “looker”.
- “dup” is for a duplicate sample collected from the creek side by side along the first sample and at the same time, in two separate containers or sampling devices. Such “Field Duplicates” are taken routinely as part of field QA/QC and are used to assess the precision of your measurements.

- “**dil**” is for dilution of a sample that had (conductivity or turbidity) values above the range of the instrument. If you dilute a sample, always record the result of the actual measured value in this box and always record the dilution factor, e.g. 1300uS x 2. You may then write the calculated Result (e.g., 2600 uS) in the Result box if you wish, but **never** write the actual reading of the diluted sample in the Result box.

Bracket/Resolution: Write the resolution of your instrument in this box if you filled out the Instrument ID box on the left. However if you think that the true value of your measurement clearly falls in between two marks on your instrument, you may report that value as you perceive it and enter the values of the marks it fell between. For example, use the Bracket box to write "7.5-8" if the pH was between the marks of 7.5 and 8 on your pH strip and you reported 7.7 in the Result box. Another example: write "40-50" if you measured the water depth at your Station using a pole with gradations every 10 cm and evaluated the depth as 45 cm.

Measurement Time: Write the time when you made the measurement or observation reported in the corresponding Result box. If you took a “chunk” of water from the creek (e.g., in a bucket or Sampler) and are doing the different measurements on the bank or at the tailgate of your car, WRITE the time you took it out of the water body (not the time you got to do the measurement itself, which may be many minutes later).

Measurement Depth: This information is one of the Measurement (or Sample) descriptors; it is different from the total depth at the station – which is a parameter (its measurement generates a Result). Record the depth below the water surface, at which your probe or sampling device intake was suspended, at the time of measurement or sample collection in the sampling device. If you collected a grab sample from the surface, write your estimate of how far into the water column your jar or bucket or beaker could have gone (e.g., “0 to 15 cm”).

Comments: Write here (or enter C1, C2 etc, and explain them on the back of the datasheet) if you did anything different from the SOP, or if something was not right in the measurement, or if there is any other thing you wish to communicate to the folks using your data. Be sure to note any difficulty in the measurement (e.g., the reading of the conductivity meter kept changing) or in the sample collection process (e.g., some sediment was suspended)

2.3 Sampling

Circle the type of sampling device you have used to collect water, either for immediate measurements or for filling Sample containers for offsite analyses. If you have collected samples for offsite analyses, fill out the space provided with the information requested in the boxes provided. Record the depth below the water surface, at which your sampling device intake was suspended, at the time of sample collection. If you collected a grab sample from the surface, write your estimate of

how far into the water column your jar or bucket or beaker could have gone. In addition, record the stream habitat (i.e., pool, run, or riffle) in which the sample was collected; use the same box (Collection Depth). In other habitats, include other observations relative to the sample site (shoreline, rocky, sandy, boat activity, recreation, etc.)

3.0 How your records will be used

The information you have recorded on this Data Sheet will be entered into a Project File database (made of multiple Excel spreadsheets or Access Tables), along with the calibration and accuracy checks recorded per SOP-9.2.1.2(Calib). Your Trainer or Technical Leader will use all the information to validate your data and evaluate their accuracy and precision. Other spreadsheets or tables in the same Project File will be filled – by the Trainer and Technical Leader - with information about your Station location, about the Instruments and Standards you have used, and about the intent and design of your monitoring Project. The data will then be exported to a central database with the relevant descriptors and qualifiers that let them “speak for themselves” and tell the data user how good they are and what they represent in the environment.

4.0 Glossary for This SOP

Accuracy: How close is our measurement to the real truth: the extent of agreement between an observed value (measurement result) and the accepted, or true, value of the parameter being measured.

Data Users: The group(s) that will be applying the monitoring results for decision making or other purpose. Data users can include the monitors themselves as well as government agencies, schools, universities, businesses, watershed organizations, and community groups.

Database: A computerized system for managing, storing, and retrieving data.

Dissolved Oxygen (DO): Oxygen dissolved in water and available for living organisms to use for respiration, usually expressed in milligrams per liter, parts per million (ppm), or percent of saturation.

Duplicate Samples (a.k.a Field duplicates): two samples taken at the same time from the same site (but into separate containers) that are carried through all assessment and analytical procedures in an identical manner. Duplicate samples are given separate (and unique) Sample IDs. Results of duplicate samples are used to evaluate the Reproducibility of the measurements.

Field Operator: The Project person who conducts monitoring activities in the field, including measurements, calibrations and/or accuracy checks, and sampling.

Parameter (a.k.a. characteristic): A property or substance to be measured within a medium. Parameters include properties such acidity (pH) or electrical conductivity, particulates such as suspended solids or bacteria, and analytes such as ammonia or heavy metals.

pH: Numerical measure of the hydrogen ion concentration used to indicate the alkalinity or acidity of a substance. Measured on a scale of 1.0 (acidic) to 14.0 (basic); 7.0 is neutral

Precision: A measure of how close repeated measurements are to each other.

Project: A data collection effort, performed by one or more organizational entities, which is limited in space and time.

Replicates: two or more test tubes taken from the same sample container and analyzed in parallel, or repeated titrations of the same fixed sample (i.e., measurements relating to a common Sample ID). “Split samples” are replicates because they originate from a common container and represent the same “chunk” of water. Results of replicate samples are used to evaluate the Repeatability of the measurements.

Result: The outcome of a measurement or an observation. Results can be expressed in numbers, words (“verbal categories”), or ranges or numbers (“numeric range categories”).

Significant digits: digits in a numerical Result that have a number that is meaningful. In most cases three significant digits are fine, e.g., 10.4 mg/l DO (all three digits are significant) or 1560 uS (the first three are significant, the last one provides the order of magnitude but the difference between zero and, say, 2, is not significant).

Split Samples: Two or more Replicates that have originated from a common Sample container and thus represent the same “chunk” of water. Split Samples are often used to compare performance of different laboratories, in what is commonly termed “round robin tests”.

Standard Operating Procedure (SOP): A written document providing step-by step instructions for performing a procedure (sampling, measurement, or other).

Water Quality Parameters: Any of the measurable properties, qualities or contents of water.

5.0 Sources and Resources

(This section is common to all DQM-SOPs, except for the title and SOP number in the citation) This SOP is an integral part of the Data Quality Management (DQM) System implemented by the Clean Water Team, the Citizen Monitoring Program of the California State Water Resources Control Board.

For an electronic copy, to find many more CWT guidance documents, or to find the contact information for your Regional CWT Coordinator, visit our website at www.swrcb.ca.gov/nps/volunteer.html

If you wish to cite this SOP in other texts you can use “CWT 2004” and reference it as follows:

“Clean Water Team (CWT) 2004. Use of the DQM Field Data Sheet for Water Quality Monitoring, DQM SOP-9.2.1.1. in: The Clean Water Team Guidance Compendium for Watershed Monitoring and Assessment, Version 2.0. Division of Water Quality, California State Water Resources Control Board (SWRCB), Sacramento, CA.”

6.0 The Form

(see below – form and one-page instructions sheet)

SOP-9.2.1.1

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DQM Field Data Sheet for Water Quality Monitoring

Date _____ Page _____

of _____

Waterbody Name: _____

Project Name and/or ID: _____

Station ID: _____

Group/Organization name and/or ID: _____

Station Name: _____

Team Name: _____

Station Habitat (*circle one*: Pool, Run, Riffle)

Trip ID _____ Station Visit ID _____

Leader (name & phone #): Members: <i>(list additional names on back)</i>	Date of last rain
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Observations: *Circle one underlined option:*

Observations Time: _____

Cloud cover	<u>no clouds</u> ; <u>partly cloudy</u> ; <u>cloudy sky</u>
Precipitation	<u>none</u> ; <u>misty</u> ; <u>foggy</u> ; <u>drizzle</u> ; <u>rain</u> ;
Wind	<u>calm</u> ; <u>breezy</u> ; <u>windy</u> ;
Water Murkiness	<u>clear water</u> ; <u>cloudy water</u> (>4" visibility), <u>murky</u> (<4" visibility). [this pertains to the water itself, not to scum]
Flow conditions	<u>dry creekbed</u> ; <u>isolated pools</u> ; <u>trickle</u> (< 0.25 gal/sec); <u>< 5 gal/sec</u> ; <u>> 5 gal/sec</u> ; <u>full waterway</u> no observed flow
Sample color	<u>none</u> ; <u>amber</u> ; <u>yellow</u> ; <u>green</u> ; <u>brown</u> ; <u>gray</u> ; other:
Sample odor	<u>none</u> ; <u>fresh algae smell</u> ; <u>chlorine</u> ; <u>rotten eggs</u> ; <u>sewage</u> ; other
Other (presence:)	<u>algae or water plants</u> ; <u>oily sheen</u> ; <u>foam or suds</u> ; <u>litter</u> ; <u>trash</u> ; other

Measurements

Instrument ID	Parameter	Unit	Result	Repeated Measurement Result	Bracket/Resolution	Measurement Time	Measurement Depth*	Comments
	Total Depth (at Station) or Staff Gage readout	cm					not applicable	
	Specific conductivity	uS/cm						
	Dissolved oxygen (DO)	mg/l (ppm)						
	Temperature, water	°C						
	pH	pH						
	Transparency	cm						

*Measurement Depth: (Select) surface; mid-column; near-bottom; (or provide measured number and unit)

Sampling Device: (for observations, measurements, and Samples): none; pole&beaker; bucket& rope; Kemmerer; other:

Sample ID (for offsite analyses)	Collection Time	Collection Depth	Sample Containers
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How to fill out the DQM Field Data Sheet for WQ Monitoring “CHEAT SHEET”

Identifiers on top left of the sheet: Creek name; Project information.

When and Where - Date, Station ID, Station name (optional), and stream habitat on the top right corner of the sheet. If you track the sequence of your monitoring Trips (excursions for the day) and Station Visits (for each station), write the unique Trip ID and the Station Visit ID for that trip; otherwise leave blank. Always use a new sheet for each new station visit, and track the page number on each sheet (top right) in the sequence you used them.

Who – Team name (e.g., JB Crew) the name of the monitoring team leader (e.g., John Blue) and the names of the other team members; use the back of the sheet for more names if needed. It is important to have at least one phone number to contact with questions.

Rain history - the date of the last rain or how many days or weeks ago you think it occurred.

Observations – Write the approximate time above the Observation box and, for each line, circle the word or phrase that best describes what you see. Add descriptors if relevant. If you also measure flow or wind speed (using an object or an Instrument and generating numerical Results), use the empty boxes at the bottom of the Measurement section below to report your measurement as instructed below.

Measurements - complete one row for each Result. If you measure one parameter with more than one instrument (e.g., using both a pH strip and a pH electrode), fill in a new row at the bottom for that additional Instrument and measurement Result.

Instrument ID - fill in the unique Instrument ID as it is written on your instrument (for example, “DOW-STB3a”).

Parameter – The sheet already has a selection; you can add parameters at the bottom of that table if needed. If you cannot measure the total water depth at the Station during your Station visit, enter “not tested” in the Result box. Note: “Specific conductivity” assumes you have a meter with ATC.

Result - Write the result of each measurement in the appropriate row in the Result box. **Units:** Make sure the units are correct (change if needed).

Repeated Measurement Result: While the "Result" field is for the result of the first measurement with a given Instrument, this field is for additional results obtained with the same Instrument for the same station at the same time or immediately after the first. Write the new results in that box and indicate if it was a repeated measurement or a measurement of a diluted sample (see the SOP for detail).

Bracket/Resolution: Write the resolution of your instrument in this box if you filled out the Instrument ID box on the left. For instruments with low resolution: you may use this box to write the bracket "7.5-8" if the pH was between the marks of 7.5 and 8 on your pH strip, and you perceived it and reported it as 7.7 in the Result box.

Measurement Time: Write the time when you made the measurement reported in the corresponding Result box. Always write the actual time at your location; add “PDT” or “PST” if you want

Measurement Depth: Record the depth below the water surface, at which your probe or sampling device intake was suspended, at the time of measurement or sample collection in the sampling device.

Comments: anything you want to add or explain

Measurement depth – if you did not fill a number in the measurement table circle the appropriate category

Sampling device - what you have used to collect water, either for immediate measurements or for filling Sample containers.

Sampling for offsite analyses - Sample ID is essential as well as time and depth it was collected at.