



United States Department of the Interior
U.S. GEOLOGICAL SURVEY

Reston, Virginia 20192

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Memorandum

OFFICE OF GROUNDWATER TECHNICAL MEMORANDUM 2017.01
OFFICE OF SURFACE WATER TECHNICAL MEMORANDUM 2017.05
OFFICE OF WATER QUALITY TECHNICAL MEMORANDUM 2017.02

SUBJECT: Clarification of Water Mission Area Policy on Continuous Records Processing of Time Series Data: Categorization of Groundwater, Surface Water, and Water-Quality Sites/Records

The purpose of this memo is to clarify the appropriate justification for time-series record and site category assignments outlined in [WRD Policy Memorandum No. 2010.02](#), "Continuous Records Processing of all Water Time Series Data", issued March 30, 2010. Water Science Centers (WSCs) should use the following guidance to ensure all time-series records and sites is properly categorized, especially ice-affected discharge records and furnished records. This memo also establishes the requirement for WSCs to document a site's categorization in each station description. The use of Category 2 and Category 3 should be only in those instances where necessary to maintain the basic tenets of WRD Memo 2010.02 and no site or record classification other than Category 1 should be applied in blanket fashion. Record and site re-categorization should be completed no later than June 30, 2017 and reviewed annually. These new category justifications will be reviewed as part of the triennial technical reviews.

Categorization of Time-Series Records

[WRD Memo 2010.02](#) requires WSCs to assess data collection sites/records to determine an appropriate Continuous Records Processing (CRP) category for each time-series data type associated with a site. At instrumented sites, the timeline defined in the CRP standards ([WRD Memo 2010.02](#)) for any period begins at the time of the first measurement from the sensor. This standard applies to groundwater, surface water, and water quality data. Record-approval timelines should be consistent with CRP policy [WRD Memo 2010.02](#). Data from Category 1 sites must be approved within 150 days, Category 2 within 240 days, and Category 3 by June 1st of the following year. In many situations, hydrographers have enough information after a site visit to work, review, and approve all continuous records since the last site visit.

Most WSCs previously categorized sites conservatively and as a function of long-term site conditions exclusively. However, the CRP concept requires that the site and record classification be updated periodically to reflect current, prevailing conditions and potential operational improvements. Therefore, WSCs should periodically review their CRP site categorizations for all time-series records, and enter a brief justification for selecting Category 2 or 3 into the Records Management System (RMS). The records categorization justification will display in the Site Information Management System (SIMS) station description.

Considerations for Groundwater Level Sites/Records

As stated above, groundwater record-approval timelines should be consistent with CRP policy WRD Memo 2010.02. The timeline begins with the first measurement from the sensor, and review and approval goals for Category 1, Category 2, and Category 3 sites apply fully to groundwater data. In most situations, the hydrographer has enough information after a site visit to work, review, and approve all groundwater level measurements since the last site visit.

Once a typical continuous record groundwater site is established and working properly, it is not necessary to visit the site as frequently as a streamflow discharge site. Environmental conditions, study needs, data storage capabilities, and drift patterns of sensors should be used to determine the frequency of site visits needed to perform manual (calibration) measurements—perhaps only several times per year, as described in the 2012 Groundwater Value Engineering study. The hydrographer should document the record review after each site visit and determine if more frequent site visits are necessary to maintain data quality. Restated, site-visit frequency should be adjusted based on study needs, stability of the instrumentation installed at the site, and storage limitations of recording device.

Under the current categorization definitions, the frequency of site visits affects the approval timelines. So what category should I assign to my time series well? For groundwater sites visited frequently, the Category 1 timeline can and should be accomplished. If it is determined that (a) less frequent site visits are required to maintain data quality, or (b) multiple site visits are necessary before data can be approved (due to instrument drift, for instance), Category 2 is more suitable. If a continuous groundwater site is visited quarterly, for example, the hydrographer has about 2 months after a site visit to work, review, and approve the data. If that timeline cannot be met, Category 2 is more appropriate for this site. The use of Category 3 should be rare and the reasons should be data-driven. The Center must document the timeline and any unique review procedures used to justify Category 2 and 3 records in the RMS records categorization explanation.

The timeline for record approval of continuous groundwater sites may be redefined in future CRP policy. In practice, most continuous groundwater data should be reviewed and approved in a timely manner regardless of the frequency of site visits.

Considerations for Surface-Water Records

WSCs generally follow appropriate CRP categorization requirements for surface-water sites but some clarification is needed. The following specific guidance applies:

1. **Ice-affected Discharge Sites**—WRD Memo 2010.02 states, “*Category 2 sites are defined as sites/records for which more data are needed for specific seasonal record computation (such as long term ice effect), streamgages that have unstable controls and longer periods are needed to determine trends, or where data from continuous water-quality analyzers depend upon laboratory results for verification.*” As a result (and regardless of the frequency, duration, or complexity of ice conditions), some WSCs have assigned all or most sites subject to ice effect as Category 2 (240 days allowed to review and approve the record) or even Category 3 (continuous records processing requirements do not apply). In 2010, one of the justifications for exempting sites with ice-affected record from Category 1 classification was based upon a then-typical 3-month delay in getting climatological data from National Weather Service (NWS)—this is no longer the case, because the NWS now makes these data available relatively quickly, usually within a few days. In many cases, winter discharge record accuracy will not improve by waiting for additional data; flows can be adequately estimated after obtaining a discharge measurement and evaluating readily available temperature data. In addition to NWS data, WSCs often collect their own air temperature time-series data at selected stations for use in estimating ice affected streamflow—an even more efficient and site-specific process that is not dependent upon external data sources. Examination of many records prone to ice in northern tier states currently classified as Category 1 shows those records seldom have problems meeting the 150-day approval goal. Similarly, in the same or adjoining states, a cursory inspection of sites classified as Category 2 or 3 (presumably due to ice) shows that record approval often still meets the Category 1 standard of 150-days.

However, there are valid justifications for assigning Category 2 to an ice-affected site, all of which need to be documented specifically in each site’s station description. Among them:

- Safety concerns (thickness / stability of the ice cover) can prevent staff from making measurements at prescribed times during the winter. Such conditions will be site specific, and will vary from one winter to the next; the ability to make field measurements and process/approve the data will need to be evaluated in accordance with the unique conditions experienced each year.
- Hydrologic complexity of the winter record may justify the need for additional analysis time. Factors include:
 - Multiple stations on the same stream or within the basin often necessitate the need to coordinate records processing. Hydrographic comparisons and volume analysis are often used to make adjustments needed to ensure network continuity and to make the records more defensible (discharge records for river systems monitored by a single gage generally are easier to finalize in a shorter time period).

- Variable ice thickness and flow paths (particularly in wide, low-gradient rivers) can bias the discharge low, requiring more extensive analysis and a longer window of data collection.
 - Winter-access logistics for some sites might preclude analysis and approval within 150 days.
2. **Unstable controls with major shifting**—Generally, the shape (hydraulic underpinnings) of the base rating or shift-adjusted rating for an unstable control is likely to continue to undergo significant changes. Such a situation might be evident based on a gage history of frequent channel morphology changes such as beaver dams, or braided channels. It is likely Category 2 assignments would be permanent unless site conditions stabilize. However, so long as a base rating exists (even if changing), one would expect the flow data at such sites to be finalized within 240 days.
 3. **Undefined rating**—In general, this would be a temporary Category 3 assignment for sites where the base rating has not yet been defined. Examples would include new stations, temporary gage re-locations, unknown recent major flood effects or ongoing downstream construction/land use changes. Permanent assignment of a site operated by USGS as Category 3 would be rare.

Considerations for Water-Quality Records

The need for careful consideration of site/record classifications also applies to continuous-record water-quality data collection sites. The following specific guidance applies:

1. **New or Complex Water-Quality Sensors**—WSCs operating new or complex water-quality sensors may require an extended period of time to develop a level of proficiency before records can confidently be approved. While developing these proficiencies, record approval may exceed the timeframes identified for Category 1. While the WSC develops this expertise, the time-series record should be temporarily assigned Category 2 or 3. However, once the WSC is proficient with working and approving the time-series record, it should be set to Category 1. The temporary assignment of such record to Category 2 or 3 should be no more than 2 years.
2. **Manufacturer Sensor Recalibrations**—Some water-quality sensors also may require annual recalibrations performed by the manufacturer. The record for such a sensor is often only approved after the most recent recalibration. However, calibration checks should be performed by the WSC at least quarterly and can be used to apply corrections to the time-series record. Records such as these should be temporarily assigned Category 3 until WSCs are confident that records can be approved quarterly using calibration checks, at which time they can be re-assigned to Category 1. The temporary assignment of such records to Category 3 should be no more than 2 years.
3. **Sample Dependent Records**—Time-series records used as surrogates to compute other water-quality parameters of interest are typically assigned to Category 1. However, the

computed time-series data are approved only after an adequate number of discrete samples have been collected across a range of hydrologic conditions to fully develop and/or validate the model (Rasmussen and others, 2009). The resulting computed time series based on surrogate data may be assigned to Category 3. Similarly, measurements that may require a bias correction for matrix effects or other conditions not evident with calibration-check standards should also be assigned to Category 3 until an adequate number of discrete samples are available for the correction (Pellerin and others, 2013). The temporary assignment of such records to Category 3 should be no more than 2 years.

Furnished Records

Many WSCs receive data supplied by outside entities for publication by the USGS or to assist USGS staff with processing time-series records for USGS sites. Often, these data are not supplied in a manner consistent with [WRD Memo 2010.02](#) (once per year in some cases). WSCs should assign categories to such records in accordance with the frequency at which the WSC is supplied the data and is able to perform the required quality assurance, **OGW Technical Memorandum No. 2016.01, OSW Technical Memorandum No. 2016.04, or OWQ Technical Memorandum No. 2016.08**. [Water Mission Area Policy on Accepting Furnished Records](#) (OGW 2016.01, OSW 2016.04, OWQ 2016.08). In those cases where data are supplied to the USGS annually or at inconsistent intervals, the appropriate record category would again be Category 3.

Summary

In conclusion, Category 2 and Category 3 should be used only in those instances where necessary to maintain the basic tenets of WRD Memo 2010.02: *(1) all time-series data will be as close to approval as computational methods and hydrologic interpretation will allow, and (2) modifications to our computational procedures should not be made if it can be shown they degrade the accuracy of the hydrologic information published by the USGS.*

There are records where the category assignment could change during the course of the year due to normal variations in physical conditions (ice-affected versus warm-weather records at a site, for example) or because of a need to acquire more site/record-specific data, such as discrete samples or sensor calibration information. WSCs with such sites should toggle category assignments back and forth and records should always be worked as quickly as the supporting data will allow.

No site or record classification other than Category 1 should be applied in blanket fashion; the conditions associated with each site or record type should be evaluated on a case-by-case basis. Stations and records classified as Category 2 or Category 3 must be accompanied by brief, site-specific justifications in RMS. The justification will display in the SIMS "SITE CATEGORIZATION" section of the station description (see examples in the appendix).

An assessment of current site and record categorization for compliance with this technical memorandum should be completed by WSCs no later than June 30, 2017. Adherence to these new policy guidelines for site and record categorization will be evaluated in future triennial reviews to verify that category assignments are being made appropriately.

William L. Cunningham
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Chief, Office of Water Quality

References Cited

- Pellerin, B.A., Bergamaschi, B.A., Downing, B.D., Saraceno, J.F., Garrett, J.A., and Olsen, L.D., 2013, Optical techniques for the determination of nitrate in environmental waters: Guidelines for instrument selection, operation, deployment, maintenance, quality assurance, and data reporting: U.S. Geological Survey Techniques and Methods 1–D5, 37 p. (available online at <http://pubs.usgs.gov/tm/01/d5/>)
- Rasmussen, P.P., Gray, J.R., Glysson, G.D., and Ziegler, A.C., 2009, Guidelines and procedures for computing time-series suspended-sediment concentrations and loads from in-stream turbidity-sensor and streamflow data: U.S. Geological Survey Techniques and Methods, book 3, chap. C4, 52 p. (available online at <http://pubs.usgs.gov/tm/tm3c4/>)
- USGS, 2016, “Water Mission Area Policy on Accepting Furnished Records”, Technical Memorandum (available online at <http://water.usgs.gov/admin/memo/GW/gw2016.01.pdf>)
- USGS, 2010, “Continuous Records Processing of all Water Time Series Data”, Water Resources Discipline Policy Memorandum 2010.02, (available online at <http://water.usgs.gov/admin/memo/policy/wrdpolicy10.02.html>)

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APPENDIX – Examples of “SITE CATEGORIZATION” in SIMS Station Description

Within the Site Information Management System(SIMS) used to maintain station descriptions, there is a new “SITE CATEGORIZATION” component which automatically extracts the categorization information from the Records Management System (RMS) and auto-populates the SIMS station description (see examples below). This includes both the record category and any justification provided in the text field within RMS (required for Category 2 or 3 assignments).

Example 1:

Station Description View

09415460 SAMPLE RIVER NR RED MTN AT
PRESTON, NV

Responsible Office
U.S. Geological Survey
Carson City - Water Science Center
2730 N. Deer Run Rd
Carson City, NV 89701
(775) 887-7649

Most recent revision: 11/10/2015 12:02:22 PM
Revised by: lrbohman

SITE CATEGORIZATION—

Discharge, Category 2 - Hydrographic comparisons and volume analyses with other ice-affected sites (09415450 and 09415495) on the same river are required to ensure network continuity; Water Quality Monitor, Category 1; DTS-12 turbidity monitor, Category 3 – Monitor is returned to the manufacturer annually for recalibration; fDOM monitor, Category 3 – This is a new monitor for the WSC and in-house expertise is being developed; Nitrate monitor, Category 2 – Further sample collection is needed to verify the observed bias in the sensor readings; Sediment computed by surrogate, Category 3 – Further sample collection is need to verify the regression model used to compute suspended sediment concentration; Precipitation, Category 1.

LOCATION.--Lat 38°56'07", long 115°17'51" referenced to North American Datum of 1927, in NE 1/4 NE 1/4 sec.2, T.12 N., R.59 E., White Pine County, NV, Hydrologic Unit 15010011, on right bank near US Forest Service campground, picnic area, about 8.0 mi west of U.S. Highway 6, and about 14.5 mi northwest of Preston.

Example 2:

Station Description View

12345678 EXAMPLE CREEK AT
ALPHARETTA, GA

Responsible Office
U.S. Geological Survey
[Atlanta - Water Science Center](#)
1770 Corporate Drive, Suite 500
Norcross, GA 30093
(678) 924-6700

Most recent revision: 11/10/2015 12:02:22 PM
Revised by: tkenney

SITE CATEGORIZATION.-- Discharge, Category 3 - New station installed August 2015. Stage discharge rating in development until additional channel control and high water measurements can be collected.

LOCATION .--Lat 33°56'28", long 82°49'31" referenced to North American Datum of 1927, Wilkes County, GA, Hydrologic Unit 03060104, at the bridge on Vinson Road, 0.9 mi upstream from confluence with Clark Creek, 1.8 mi downstream from confluence with Macks Creek, and 6.0 mi northwest of Tignall.

Example 3:

Station Description View

87654321 FROZEN RIVER AT WINTERS,
AK

Responsible Office
U.S. Geological Survey
Fairbanks Field Office
3400 Shell St.
Fairbanks, AK 99701
(907) 479-5645

Most recent revision: 11/15/2015 14:05:27 PM
Revised by: tkenney

SITE CATEGORIZATION.-- Discharge, Category 2 - Gage is reached by helicopter, with limited site visits during winter due to safety concerns. Longer periods between site visits often delay collection of data needed to approve record.

LOCATION. --Lat 64°02'04", long 142°31'42" referenced to North American Datum of 1983, in SW 1/4 SW 1/4 NW 1/4 sec.17, T.26 N., R.15 E., Southeast Fairbanks Division, AK, Hydrologic Unit 19040104, (Eagle A-3 quad), on left bank, approximately 2 miles downstream of Kechumstuk Creek and 2 miles northeast of the historic Kechumstuk village and mining area.

Example 4:

Station Description View

132624144452771 A-20, Ordot, Guam

Responsible Office
 U.S. Geological Survey
 Pacific Islands Data Section
 1845 Wasp Blvd. B176
 Honolulu, HI 96818
 (808)690-9600

Most recent revision: 5/3/2016 1:53:08 PM

Revised by: tkpresle

SITE CATEGORIZATION.--Groundwater Continuous, Category 2 - Site visits are infrequent and span greater than 2 months between visits due to site access limitations.

LOCATION.--Lat 13°26'30.3", long -144°45'34.7" referenced to North American Datum of 1983, Guam County, GM, Hydrologic Unit is unknown, at Ordot School, 1.4 miles west of junction of Routes 4 and 10, Ordot.

Example 5:

Station Description View

644454147151701 FD00200213ABBB1
006 DSAP-6

Responsible Office
 U.S. Geological Survey
 Fairbanks Field Office
 3400 Shell St.
 Fairbanks, AK 99701
 (907) 479-5645

Most recent revision: 11/7/2016 5:22:34 PM

Revised by: matts

SITE CATEGORIZATION.--Groundwater, Category 3 - Other - Well shut down during winter months. Due to frost heaving at the site, levels are run twice per year and more time is needed to determine corrections before approving water-level records.

LOCATION.--Lat 64°43'31", long 147°18'39" referenced to North American Datum of 1927, in NW 1/4 NE 1/4 SE 1/4 sec.22, T.2 S., R.2 E., Fairbanks North Star Borough, AK, Hydrologic Unit 19080306, (Fairbanks C-1 NW quad), Fairbanks Meridian, Well located on north side of Old Richardson Highway and VFW Road intersection in city of North Pole.