

Documentation Methods for Water Quality & Hydrologic Data Review

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HOW GOOD IS YOUR MEMORY?

If someone wanted to re-use the data from an old project of yours and asked for details on how it was revised, could you explain? How far back can you remember? Two years? Ten?

Increasingly, scientific data are considered a stand-alone research product of equal value to the traditional research paper¹. These data have much potential for re-use; however, too often important information about how data were reviewed exists only in the memory of project staff. Documenting the review history of a data set can greatly increase its value for re-use, and can provide additional benefits to a typical monitoring project².



SOLUTIONS

The Water Quality Section of the Illinois State Water Survey has successfully implemented data review documentation based on one simple idea: write down what was done and why. This is accomplished with two documents:

1. The **review form** is where any changes to data are explained and justified.
2. The **Standard Operating Procedure (SOP)** explains in detail each data review step in the order it is performed.

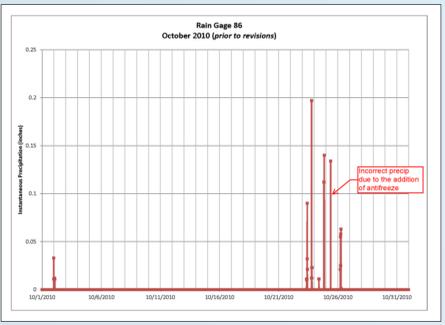
¹ National Science Board. 2012. *Digital Research Data Sharing and Management*. Arlington VA: National Science Foundation (NSB-11-79). Retrieved 4/2014 from <http://www.nsf.gov/nsb/publications/2011/nsb01211.pdf>
² Burley, T.E., and Peine, J.D. 2009. *NBI-SAIN Data Management Toolkit*. U.S. Geological Survey Open-File Report 2009-1170, 96 p.

THE REVIEW FORM: SERVICE HISTORY- FOR DATA!

Section A: Data Identifiers
The data identifier section indicates which data are under review.

Section B: Data Organization
The data organization section provides information on the location and names of the data files under review.

Section C: Data Review
The data review section is where data are checked for errors and completeness.



A Rain Gage Data Retrieval Log for Gage 86 for the month of October 2010

B Data Organization
Raw Data Files
Precipitation: \FRSGmon\Data\Precipitation\RG_86_\RawData\Instantaneous
Daily Status: \FRSGmon\Data\Precipitation\RG_86_\RawData\DailyStatus

Daily Status	File Names	Precip	Start Date/Time	End Date/Time
RG86_DailyStatus_20101011__dat_RG86_Precip_20101011__dat			6/22/10 05:30	10/11/10 07:15
RG86_DailyStatus_20101025__dat_RG86_Precip_20101025__dat			09/27/10 08:15	10/25/10 09:15
RG86_DailyStatus_20101108__dat_RG86_Precip_20101108__dat			10/25/10 09:30	11/08/10 08:45

C Data Review
 Yes No Station number incorrect?
 Yes No Obvious incorrect times?
 Yes No Obvious incorrect precip values? Attach graphs prior to revising
 Yes No Drops in battery voltage?
 Yes No Gaps in data? When?
 Yes No Non-zero gage status values? List values & definitions:
 Yes No Corrective action needed? Describe action taken:
 False precip value on 10/25/2010 9:30 due to the addition of antifreeze. Replaced with 0 since it was not raining on site.
 Corrections complete? Yes No

D Backups
Files backed up? Yes No Location: \\Illinois\CWSFiles\FRSGmon\Data\Precipitation

E Attachments
 Cumulative Precip graph (final) Instantaneous Precip graph (final) Battery Voltage graph (final)

F Date 11/9/10 Initials: KLV
 FINAL REVIEW Date 5/23/2011 Initials: JIH
 Date 5/23/2011 Initials: JIH

Data Exporting
 Imported data to database
 Generated hourly totals
 Generated daily totals
 Attach daily summary table



Section D: Revision Notes
The revision notes section is where any changes to data are explained and justified.

Section E: Attachments
The attachments section indicates if any supplementary materials are attached.

Section F: Date & Initials
The date and initials fields are used to track who completed the review and who checked and approved the review.

WHY DOCUMENT DATA REVIEW?

1. Increases confidence in data quality
2. Preserves history of data revision
3. Standardizes data processing procedures
4. Allows delegation of some review tasks
5. Enables sharing of raw data



STAGE DATA EXAMPLE

Stage Data Review and Verification
 Station DHEZC-01 for the Month of January 2012

Files were appended into the monthly Excel file: DHEZC-01a201201.xls

Single data point estimations reviewed.
 15-min stage data plots (prior to major revisions) attached.

Major revisions needed? Yes No. If Yes, Describe:
 There was a leak where the bubbler line connects to the bubbler from the beginning of the month until it was fixed on 1/5/2012 at 1100. Since there were no rain events during this time, the stages will be interpolated from the reading stage in December (99.17) to the stage at the time the leak was fixed (99.16). A linear interpolation using auto-fill in Excel will be used.
 Note: stages for entire month are below spillway.

15-min stage data plots (showing original + revised data) attached.

IDAPP input file saved as: DHEZC-01a201201.xls (filename) and in the format: CR108

IDAPP Program (filename) (date) (rev. date)
 Stage - Daily Table format: d DHEZC-01a201201_sdp 2/24/2012
 Stage - PH format: ph DHEZC-01a201201_sdp 2/24/2012
 Save Daily Table in EXCEL (using Double macro) dDHEZC-01a201201.xls
 Paste PH file in EXCEL template (STN&V\YYMM.xlsx) DHEZC-01a201201.xls
 IDAPP output files annotated with stage as determined by tape down

Revisions Needed? Yes No. If Yes, Describe:
 Revisions Made (date)

Daily Table (from Excel) printed to PDF and attached
 PH Data Plot printed to PDF and attached

Rev: 01/11/10/01 FINAL DATA Date: 2/23/2012 Initials: JIH
 Rev: 01/11/10/01 FINAL REVIEW Date: 2/23/2012 Initials: JIH

CONTINUOUS MONITORING EXAMPLE

Continuous Water Quality Data Review Form
 Project: Upper Des Plaines
 Station ID: G-07 Deployment Date: 9/19/12 Retrieval Date: 9/26/12 No. Sondes: 1

File Organization
 Note all file paths branch from: \\Illinois\resour\ads\cwsfiles\EPA_LUP\DesPlains_ContinuousMonitoring
 Raw Data Location: -RawData Provisional Data Location: -ProvisionalData

Turbidity sensor calibrated and turbidity data collected? Yes No
 File Name: G-07_20120919_data Date/Time: 9/19/2012 11:15 9/26/2012 11:45
 deployed sondes: SR date/time SR date/time
 SR G-07_20120919_data SR date/time SR date/time
 SR G-07_20120919_data SR date/time SR date/time

Data Review & Corrections
 Raw data graphs attached. Select all and describe of in-stream, usable measurements.
 Continuous Monitoring Sonde: SR Sonde Date: 9/26/2012
 Sonde No.: 46794 Start Date/Time: 9/19/2012 11:15 End Date/Time: 9/26/2012 11:45
 Note any circumstances that may affect data quality (battery disturbance, calibration errors, etc.) For each circumstance list (1) reason data are suspect, and (2) date/time range affected. If corrections are needed, specify for which parameter(s).
 Sonde No.: 46794 Light sediment and insect build-up on probes upon retrieval.

Corrections needed? Yes No Parameters to correct: Temp pH SpCond DO mg/L Turbidity DO heat (w/deg)
 Corrections needed? Yes No Parameters to correct: Temp pH SpCond DO mg/L Turbidity DO heat (w/deg)
 Corrections needed? Yes No Parameters to correct: Temp pH SpCond DO mg/L Turbidity DO heat (w/deg)

Data Grading
 Error Calculations: -ProvisionalData\EPA_LUP_Cal_errr_calc_summary.xls
 Data Grader: _____
 Sonde No.: 46794 Temp pH SpCond DO Turb Comments

REVIEW COMPLETE Date: 3/16/2013 Initials: BHT
 FINAL REVIEW (Champaign) Date: 3/16/2013 Initials: JIH & AE

