Water Monitoring Program

WASHINGTON CONSERVATION DISTRICT
STANDARD OPERATING PROCEDURE (S.O.P.) No. 1

DATA MANAGEMENT

Water Monitoring Program
Standard Operating Procedure No. 1
DATA MANAGEMENT

Table of Contents

1.0   SCOPE AND APPLICABILITY

.1   Overview of Data Management Procedures

This S.O.P is designed to define the procedures that are performed in flow monitoring and/or other aspects of water resource data collection using data logging technology or water sampling activities 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 data management required by flow monitoring and/or other aspects of water resource data collection using data logging technology or water sampling. This SOP describes:

- Field data management
- Flow data management
- Water sampling data management
- Procedures for data backup

2.0   EQUIPMENT AND MATERIALS

The following equipment and materials will be required:

- Field log book or electronic field log book
- Laptop computer
- Desktop computer
- Connection to network server
- Software
  - Teledyne Isco Flowlink 5.x
  - Microsoft Office software products (Word, Access, Excel)
  - Hach Insight
  - YSI EcoWatch
  - Onset Boxcar
  - Campbell PC208W
  - Global Water

- Pendragon Forms 5.0
- Aqua Rod 4.10
- Rating curve measurement log book

3.0   PROCEDURES

.1   Procedure for Compiling and Managing Field Log Book or Electronic Log Book

.1.1   Site Data Field Notes

At least every 7 to 14 days, site visits will be performed to maintain the operation and integrity of our sites. During these visits all data will be looked at thoroughly and any noticeable problems with the data or site will be recorded in the field log book or electronic field log book.

.1.2   Field Data Log Book or Electronic Log Book Backup

Upon returning to the office after site visits, the log book or electronic log book entries will be placed in the network server via desktop computers. If traditional log book entries are performed, the field data will be entered into the appropriate computer program and saved to the server. If an electronic log book is used, the electronic form will be merged with the server via desktop computer.

.2   Procedure for Compiling and Managing Data Logger and Laptop Data

.2.1   Site Data Retrieval

At least every 7 to 14 days, site visits will be performed and all data loggers will be downloaded using the laptop computer and appropriate data logger software listed above in the equipment and materials list. Data will be looked at in the field and any potential problems with the data set(s) will be noted and possibly resolved in the field.

.2.2   Data Logger Data and Laptop Data Backup

At least every 14 days, a data backup will be performed for each field laptop. The data that was transferred from the data loggers to the laptops will be copied to the server. From this point forward, the data on the server will be accessed via desktop computers for further analysis, compiling, and management

.3   Procedure for Compiling and Managing Server Data Using Desktop Computers

.3.1   Site Data Set Management

Each site's data set will be copied from the server into a working spreadsheet using Microsoft Excel or another appropriate program. Data will only be worked on, edited, etc. within this working spreadsheet allowing for a copy of raw data to be maintained on the server.

.3.2   Site Data Analysis

The goal of the site data analysis is to determine:
1. If there were any physical problems at the site throughout the year that could affect the data that were noted within the field log and to correct them as best possible to reflect what actually occurred at the site
2. If there were any data logger malfunctions or errors in the data set (i.e. logger drift, calibration corrections) and correct them as best possible to reflect what actually occurred at the site
3. If problems could not be resolved within the data set, then noting within metadata what problems may have occurred, significant events, or other pertinent resource information to assist the data user in knowing as much about the data set as possible

.3.3   Data Editing

If it is determined from field notes that a physical problem was occurring at the site (i.e. obstruction in channel affecting stage/discharge relationship, etc.), the data would need to be edited to reflect that change during this period. There are three ways in which to perform this task:
1. Identify any potential relationships or alternative ways in which to utilize existing data to resolve problems. For example, a problem with a stage/discharge relationship being affected from an obstruction in a channel will attempt to be resolved by looking at the rating curve that was collected and if a measurement was collected during the period where the obstruction occurred, use an appropriate stage/discharge relationship shift in the curve to accurately reflect the change in discharge during that period. If no measurement was taken during that period, another alternative is to utilize the velocity data from the data logger files. If the site is equipped with a velocity meter, a surveyed channel transect and the stage can be used to determine the wetted area within the channel and product of the area and velocity will determine discharge.
2. Not all physical problems at sites will be able to be resolved. In those cases, you can attempt to estimate what occurred and interpolate data appropriately and note the change to the dataset in the metadata.

3. Completely leave that period of data collection out of the final data set and note the change to the dataset in the metadata.

If there were any data logger malfunctions or errors in the data set (i.e. logger drift, calibration corrections), then these errors must be addressed in one of three ways:

1. If the datalogger malfunctions and gives you small periods of erroneous readings that are determined by the scientist and their best professional judgment to be incorrect, the data may be able to be corrected via statistical analysis. For example, if a velocity meter gives consistent readings based on a correlated stage throughout most of the season, and for very small periods gives inconsistent readings based on the correlated stage, a stage/velocity relationship could be plotted to determine a way to interpolate the data for those small periods of time based on the stage using Teledyne Isco Flowlink 5.x or a similar program with this plotting function. Other errors in the data (i.e. logger drift, calibration corrections) can be resolved utilizing a function built within the program Microsoft Excel or similar program. This function would allow for the interpreter and computer program to use the field measurements known to be correct before and after the logged period in question and correct each time period and data logged during that period such that the correction would account for the amount of time passed between field measurements and the amount needed to be corrected for.

2. Not all malfunctions or errors at sites will be able to be resolved. In those cases, you can attempt to estimate what occurred and interpolate data appropriately and note the change to the dataset in the metadata.

3. Completely leave that period of data collection out of the final data set and note the change to the dataset in the metadata.

If problems could not be resolved within the data set, then noting within metadata what problems may have occurred, significant events, periods of data that may have been rejected, or other pertinent resource information to assist the data user in knowing as much about the data set as possible. This metadata will allow the data user to make a decision whether they are able to utilize the data for their needs or if the data will not work for their interpretation.

.3.4 Final Site Data Compilation and Storage

Once all site file changes, edits, and analysis is complete, site files will be copied into a new final site data file where only the clean, distributable data will be stored keeping all edits and changes to the working site file intact for future reference. These final site files will either be kept in a spreadsheet compatible format or will be uploaded into a database such as Microsoft Access or Teledyne Isco Flowlink 5.x for permanent storage and retrieval. These files will be automatically backed up via the network server on a regular basis. Metadata files with all explanations and descriptions of the site and necessary information will also be kept intact via the network connection and scheduled server backup.

.4   Procedure for Managing Water Sampling Data

.4.1   Water Sampling Data Retrieval and Storage

When a laboratory has completed the analysis of the water sampling data, each exported data set from the laboratory will be retrieved and stored on our server using a desktop computer. Each time a data set is retrieved, a new file will be saved to the server.

.4.2   Water Sampling Data Analysis

An analysis of the data exported from the lab will be performed by opening and copying the file on the server and creating a new file for each particular site's data. A record of lab submission sheets should correlate to each lab sample result. A comparison of these sheets to each record in the file will verify that the sample results are present and that they are not improperly labeled. Once all site results are accounted for, the results should be sorted by site to simplify the analysis process. Once sorted, each sample's results will be looked at to determine if concentrations seem inconsistent with what was expected from each site. The determination of inconsistency will be made using professional judgment by the scientist. If the result seems inconsistent with other samples from the site or if the scientist feels that the sample concentration is not realistic, a more detailed look at the sites hydrograph (if available) to determine if discharge and precipitation are consistent with the sample concentration will be performed. If the scientist feels that the sample concentration is inconsistent, the sample concentration will be left intact in the water sampling-working file, but it will be noted that the sample concentration was not used in further calculations.

.4.3   Final Water Sampling Data Storage

Once all sites water sampling data is deemed to be sound, the file will be copied and saved to a final site water-sampling file. . These final site files will either be kept in a spreadsheet compatible format or will be uploaded into a database. These files will be automatically backed up via the network server on a regular basis.

.5   Procedure for Data File Backup

.5.1   Data Changes and Schedule of File Backup

Any file that was collected or worked on during the process of collected to analysis will be backed up to a network server. On a daily basis, the network server will be backed up and saved to an external hard drive only if the information has changed if a file from the previous day. On a weekly basis, a backup will occur to an external hard drive only if a file was changed within the last week