CT DEEP
Bureau of Water Protection & Land Reuse
Monitoring & Assessment Program

VOLUNTEER STREAM TEMPERATURE MONITORING (V-STEM) NETWORK

Version 1.2
Last Revised April 2017

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INTRODUCTION & OVERVIEW

CT DEEP's Water Monitoring and Assessment Program offers support to volunteer groups interested in monitoring stream temperature in their town or local watershed. Staff in Program have developed the enclosed protocols and data submission guidance to support groups interested in submitting their stream temperature data to CT DEEP. To insure data usability by DEEP, volunteer group coordinators are strongly encouraged to contact CT DEEP *prior* to commencing stream temperature monitoring programs.

STREAM TEMPERATURE MONITORING TIMELINE

CT DEEP's WPLR Monitoring and Assessment Program encourages volunteer groups interested in collecting stream temperature data collect year-round stream temperature data. To successfully incorporate volunteer data into WPLR Monitoring and Assessment Program projects, volunteer data must, at a minimum, be collected hourly from June 1 through August 31st.

Monitoring activities typically begin during the spring, according to the following schedule.

- March/April – Logger QC checks conducted; monitoring sites field checked for suitability
- May – Loggers deployed
- June-September – Loggers remain deployed; Field checks conducted when possible
- October – Loggers downloaded
- November-February - Loggers remain deployed; Field checks conducted when possible
- March/April – Loggers retrieved from field; loggers downloaded and QC Checked
- May – Loggers redeployed

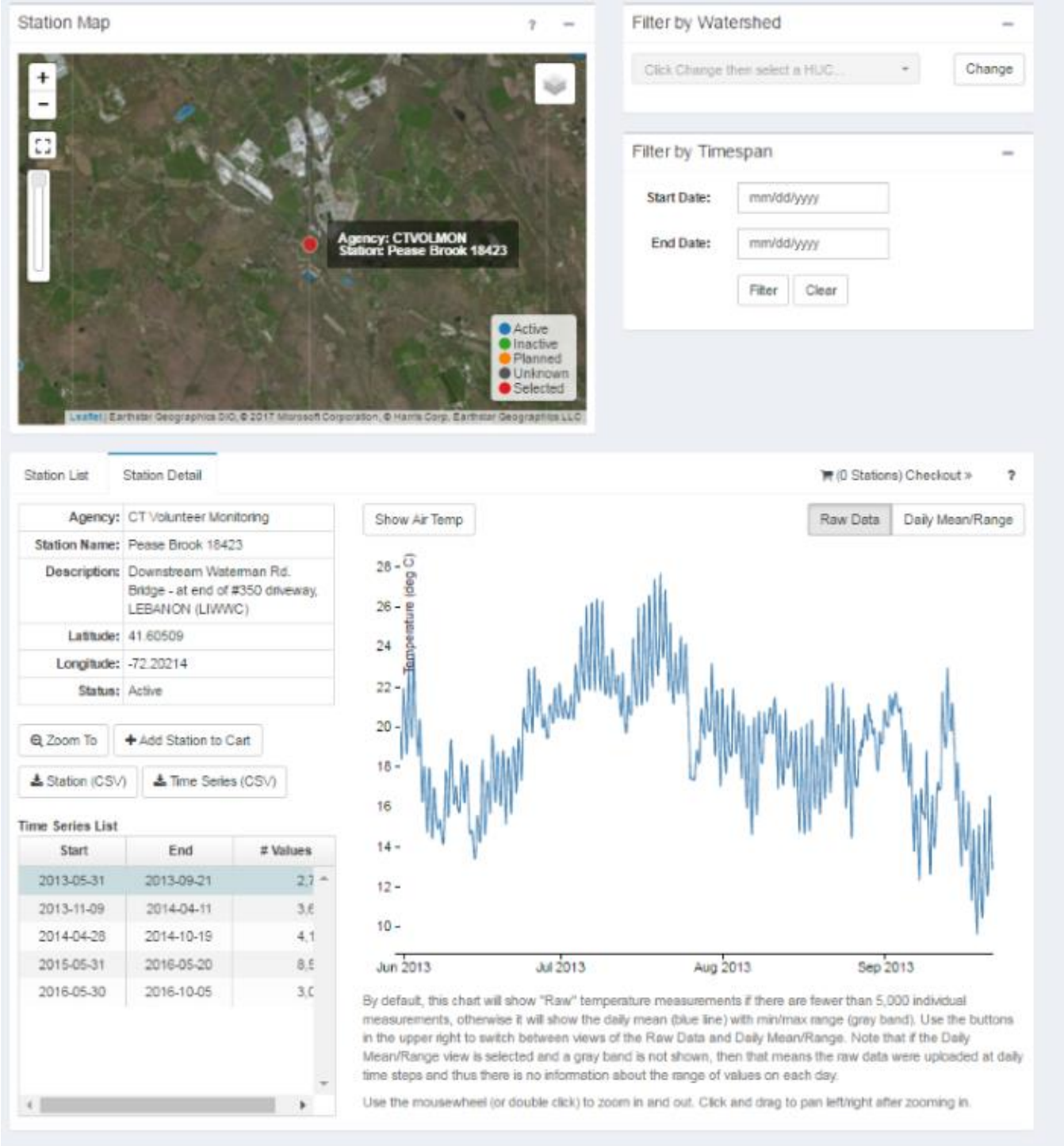
PROGRAM TRAINING REQUIREMENTS

CT DEEP provides field-based training for groups interested in developing a new stream temperature monitoring program. The V-STeM Coordinator will work with local group leaders to insure they are familiar with CT DEEP's monitoring and quality control protocols as well as the requirements for submission of external stream temperature data to DEEP. It is the responsibility of the local group leader to ensure that all volunteers participating in their local stream temperature monitoring program are trained in the enclosed protocols prior to assisting with local monitoring efforts.

DATA STORAGE

All volunteer stream monitoring data is uploaded to the online Spatial Hydro-Ecological Decision System (SHEDS) Stream Temperature Database (http://db.ecosheds.org/viewer). Through the Stream Temperature Database, groups can:

- View an interactive map of all past and current monitoring stations in Connecticut
- Explore graphs of stream temperature collected by volunteers
- Download station information and the corresponding data



DATA INTERPRETATION

Groups interested in interpreting their data are encouraged to refer to Appendix D for instructions how to analyze stream temperature data according to Connecticut's cold, cool, and warm water stream classifications.

RECOMMENDED EQUIPMENT LIST

Below is the list of specific equipment that CT DEEP's Monitoring & Assessment Program will use during 2015 to measure stream temperature. We have had success using these equipment in the past and therefore feel comfortable recommending them to volunteers for use in their own programs. The following list should not be interpreted as an official endorsement of any particular equipment or vendor. Volunteers are encouraged to explore all stream temperature monitoring equipment options available to them and select the equipment that works best for their budgets and/or individual monitoring needs.

- Stream Temperature Loggers:
    - Onset HOBO Water Temperature Pro v2 Data Logger - U22-001 -- http://www.onsetcomp.com/products/data-loggers/u22-001
- Data Download Shuttles* (include the required coupler and USB connection cables)
    - HOBO® Waterproof Shuttle - U-DTW-1 -- http://www.onsetcomp.com/products/communications/u-dtw-1
    - Optic USB Base Station - BASE-U-4 -- http://www.onsetcomp.com/products/communications/base-u-4

      **NOTE: You will only need one of the above options. The waterproof shuttles allows for downloading the loggers in the field without needing to bring a laptop to the monitoring station; the base station option will require that you bring a laptop with you to the field if you wish to do field downloads during your site visits.*
- Logger Software:
    - HOBOware Pro Mac/Win Data Logger Software
        - CD version - http://www.onsetcomp.com/products/software/bhw-pro-cd
        - Download version - http://www.onsetcomp.com/products/software/bhw-pro-dld
- Field/QC Thermometer:
    - Digi-Sense Waterproof Digital Thermometer -- http://www.coleparmer.com/Product/Digi_Sense_Calibrated_Remote_Probe_Digital_Thermometer_Waterproof/WU-90205-22?SearchTerm=WU-90205-22

PROGRAM CONTACT INFORMATION:

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LOGGER QC CHECKS

Equipment Needed:

- HOBO Prov2 water temperature logger
- Computer with HOBOware Pro and Microsoft Excel software installed
- HOBO waterproof shuttle or Optic USB Base Station
- HOBO Prov2 coupler for shuttle/base station
- Large cooler with lid
- Mesh or perforated plastic basket
- Plastic bin (Small enough to fit inside basket)
- Weight
- Four rocks or other solid objects approximately 1-inch tall
- Ice
- Water
- Clock/watch
- Thermometer
- QC Check Log (Appendix A)

NOTE: The logger QC check procedure is <u>a two-day process</u>. During Day 1 the volunteer will prepare the ice bath and schedule the loggers to launch. During Day 2 the volunteer will conduct the actual QC test.

DAY 1

STEP 1: PREPARE THE ICE BATH

1. Place the four rocks (or other solid objects, approximately 1-inch tall) on the bottom of the cooler. Place the basket on top of the rocks/objects so that the basket sits at least 1-inch above the bottom of the cooler, and the top of the basket is at least 1-inch below the top edge of the cooler.
2. Fill the cooler and the basket with ice. Add cold water to fill the cooler approximately ¾ full.
3. Add the weight to the plastic bin and fill with ice. Place the bin on top of the basket in the cooler.
4. Add additional cold water to bring the water level to just below the top of the basket.
5. Secure the cooler lid in place and store overnight in a cool location.

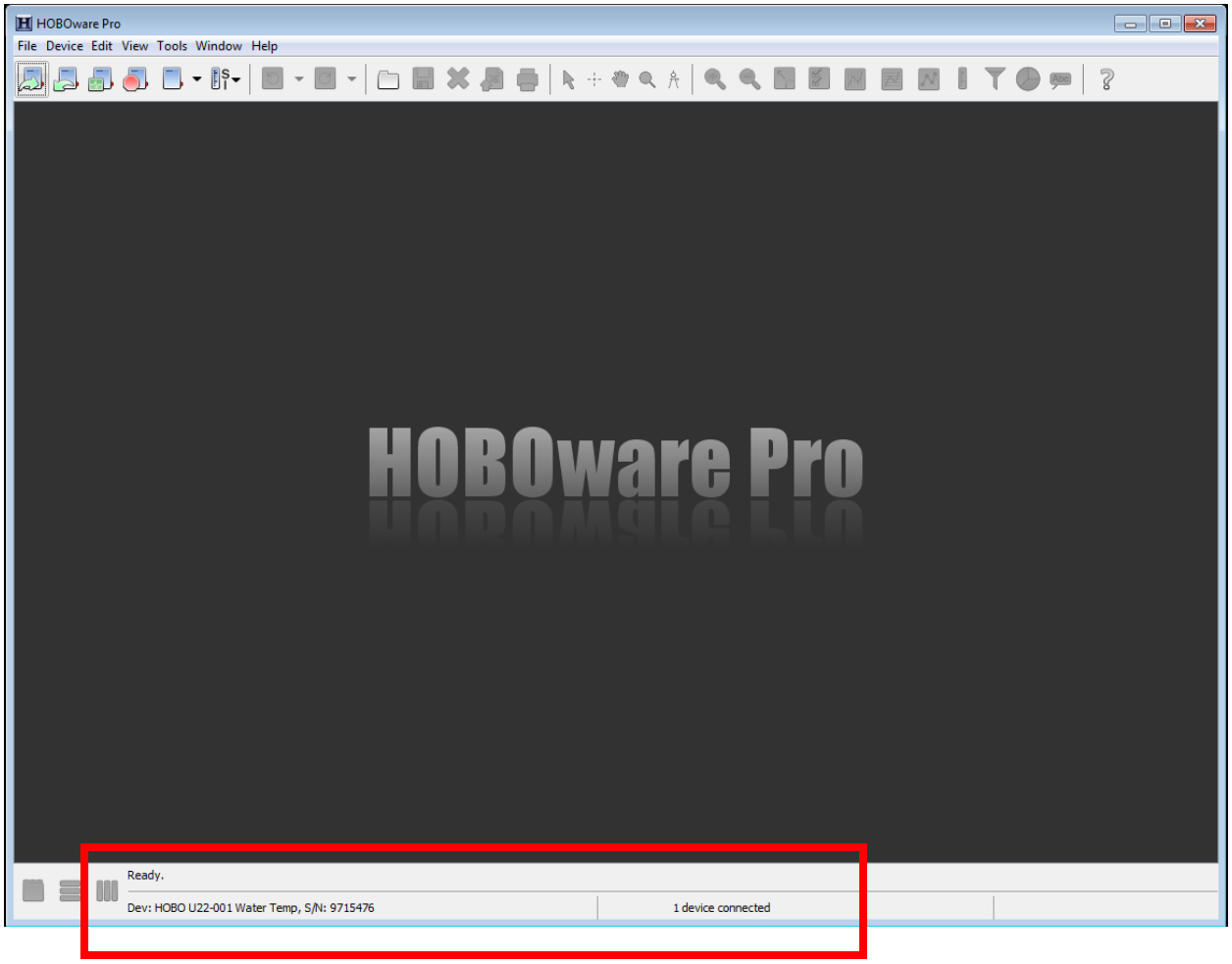
DAY 2

STEP 2: CHECK THE ICE BATH

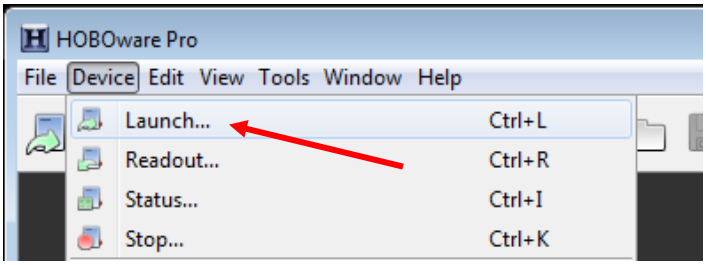
1. Remove the lid from the cooler; ensure that the cooler contains a mixture of both ice and water and measures 0.0C. (If there is no ice present in the cooler or the temperature measures warmer than 0.0C, add additional ice – draining off water as needed to make space - and allow the cooler to sit for several more hours until it consistently measures 0.0C.)
2. Using the thermometer check the cooler ice water temperature in several locations. The temperature should be 0.0C in all locations checked. If the contents of the cooler are not a uniform 0.0C, mix the ice water and allow the cooler to sit for several more hours.
3. Secure the lid of the cooler back in place.

STEP 3: SCHEDULE THE LOGGERS TO LAUNCH

1. Turn on your computer; open HOBOware Pro software.
2. Attach the waterproof shuttle/base station to the computer using the USB cable. Attach the Water Temp Pro v2 coupler (blue label, COUPLER2-C) to the base station/shuttle.
3. Record the serial number and logger type (i.e. "ProV2") of the first logger on the QC Check Log.
4. Insert the logger into the coupler so that the arrow on the logger aligns with the white arrow on the coupler label. At the bottom right of the HOBOware Pro screen the message "1 device connected" should appear. At the bottom left of the screen you should see your logger serial number displayed, e.g. "Dev: HOBO U22-001 Water Temp, S/N: [Serial Number]"



5. Set the logger to launch the next day at the time you wish to start your QC check:
    a. Select Device > Launch from the menu options at the top of the main screen



b. A "Select Device" pop-up window will appear. Select the HOBO logger with serial number you recorded on your QC log and click "OK". A "Launching logger…" message should display in the lower left of your HOBOware window.

c. The "Launch Logger" pop-up window will open. Check that the serial number displayed is the same as the number you recorded on your QC Log.

d. Record the Battery State displayed (e.g. "GOOD") on your QC Log.

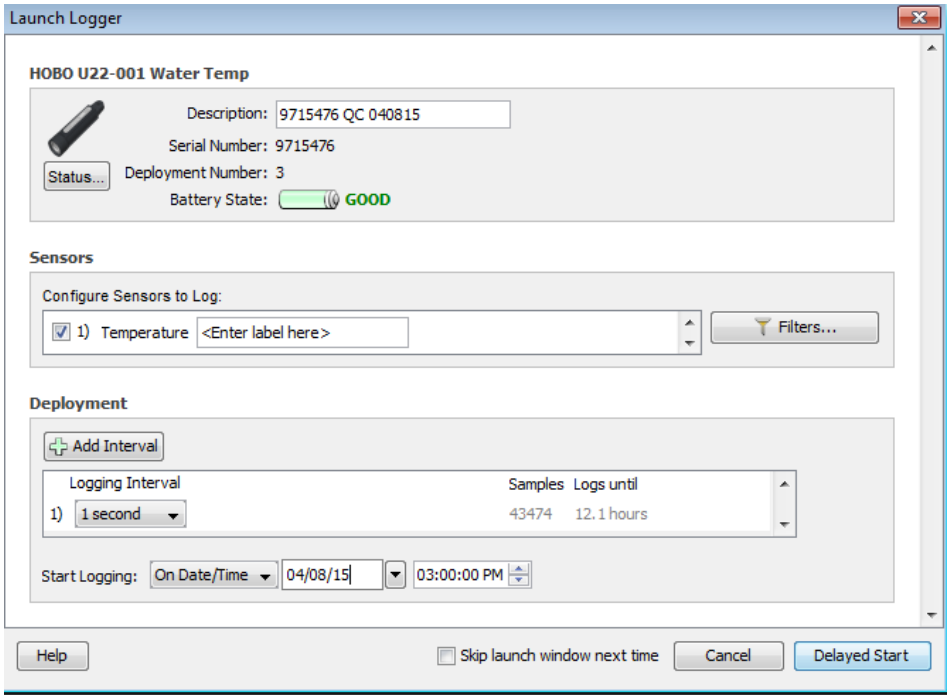
   i. *NOTE: If less than "GOOD" don't proceed with the QC check; replace the logger with a new unit or return the logger to Onset for battery replacement.*

e. Change the Description field to the following format: [Serial Number] QC [MMDDYY]. For example, for logger serial number 9715476 that will be checked on April 08, 2015, you would enter "9715476 QC 040815"

f. Set the Logging Interval to "1 minute"

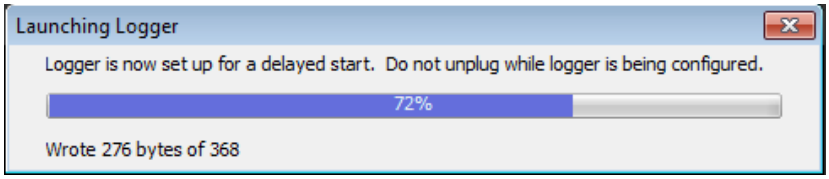
g. Schedule the logger to Start Logging "On Date/Time" and enter the date and time that the QC check will begin.

   i. *NOTE: The QC check should occur the day after the ice bath is prepared, and the logger should be set to start logging at least one hour from the time that place it in the ice bath. (This will allow the logger to acclimate to the ice water bath prior to the start of recording.)*



h. Record the scheduled launch date in the "Date" column of the QC Log. Record the scheduled launch time in the "Launch/Start Time & Temp" column of the QC Log.

i. Select the "Delayed Start" button at the bottom right of the pop-up window to complete the launch. You may see a launch progress display similar to the following:



At the conclusion of the launch you will see "Launch successful" displayed in the lower left of the HOBOware window.

j. Disconnect the logger from the shuttle and set ot the side.

6. Repeat Steps 3.1 through 3.5 above for all other loggers to be QC checked.

STEP 4: PLACE THE LAUNCHED LOGGERS IN THE ICE BATH

1. Place the launched loggers in the cooler ice bath *at least one hour before* their scheduled launch date/time.

   a. Open the cooler and set the plastic bin filled with ice and the weight to the side.

   b. Submerge all of the launched loggers, lens side facing down, into the ice water within the basket in the cooler.

      i. *NOTE: Do not overcrowd the basket with loggers. There should enough space between the loggers in the basket to allow ice water to flow freely between loggers. If you have many loggers you may need to QC check your loggers in batches.*

   c. Place the plastic bin (with the ice and weight) on top of the submerged loggers, insuring all loggers are completely submerged in the ice water bath.

   d. Thoroughly mix the ice bath water around the plastic bucket.

   e. Secure the cooler lid in place and let the cooler sit undisturbed in a cool location.

STEP 5: CHECK THE QC START TEMPERATURE

1. At the time the loggers are set to launch (i.e. begin recording data), use the thermometer to manually check the temperature of the ice bath within the cooler. Check the temperature as close to the loggers as possible, without disturbing the position of the loggers.
2. Record the temperature to the nearest 0.1C on the QC Log in the "Launch/Start Time & Temp" column – e.g. "0.0C"

   a. NOTE: If the ice bath temperature is not 0.0C then the QC check should be stopped, and the ice bath corrected (i.e. add additional ice, mix more thoroughly) until it consistently measures 0.0C. The QC process will need to be restarted from Step

3. Replace the cooler lid and let the loggers sit in the ice bath for 30 minutes.

STEP 6: CHECK THE QC MID-POINT TEMPERATURE

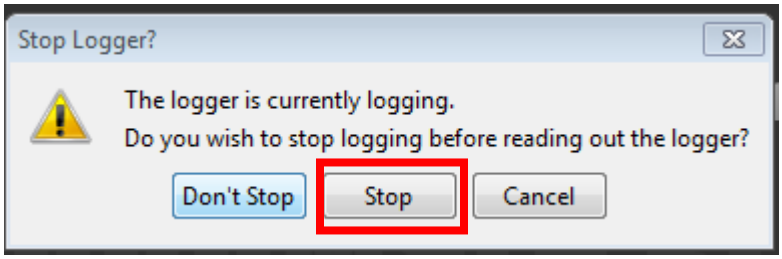
1. 30 minutes after the time the loggers were set to launch, use the thermometer to take a second manual reading of the ice bath temperature. Again, check the temperature as close to the loggers as possible, without disturbing the position of the loggers.
2. Record the time and the temperature to the nearest 0.1C on the QC Log in the "Mid QC Time & Temp" column.
3. Replace the cooler lid and let the loggers sit in the ice bath for 30 minutes longer.

STEP 7: CHECK THE QC END TEMPERATURE & REMOVE LOGGERS FROM ICE BATH

1. 60 minutes after the time the loggers were set to launch, use the thermometer to take a third manual reading of the ice bath temperature. Again, check the temperature as close to the loggers as possible, without disturbing the position of the loggers.
2. Record the time and the temperature to the nearest 0.1C on the QC Log in the "End QC Time & Temp" column.
3. Remove the loggers from the ice bath.

STEP 8: DOWNLOAD THE LOGGER QC DATA

1. Open HOBOware Pro on your computer. Create a folder on your computer to store your logger QC data. It is recommended that you keep all of you logger downloads, QC files, site photographs, etc. in one master folder on your computer and then have a "Stream Temperature QC Data Files" folder within that master folder.
2. Create a subfolder within your QC Data Files Folder and name it "HOBO QC MMDDYY" (insert the date of the QC check.)
3. Attach the logger to the base station/shuttle and wait for the "1 device connected" message to appear in the lower right.
4. Select 'Readout' from the 'Device' menu. The 'Select Device" pop-up window will open – select the HOBO logger from the list and click "OK."
5. When prompted, select 'Stop' to stop the logger from logging.

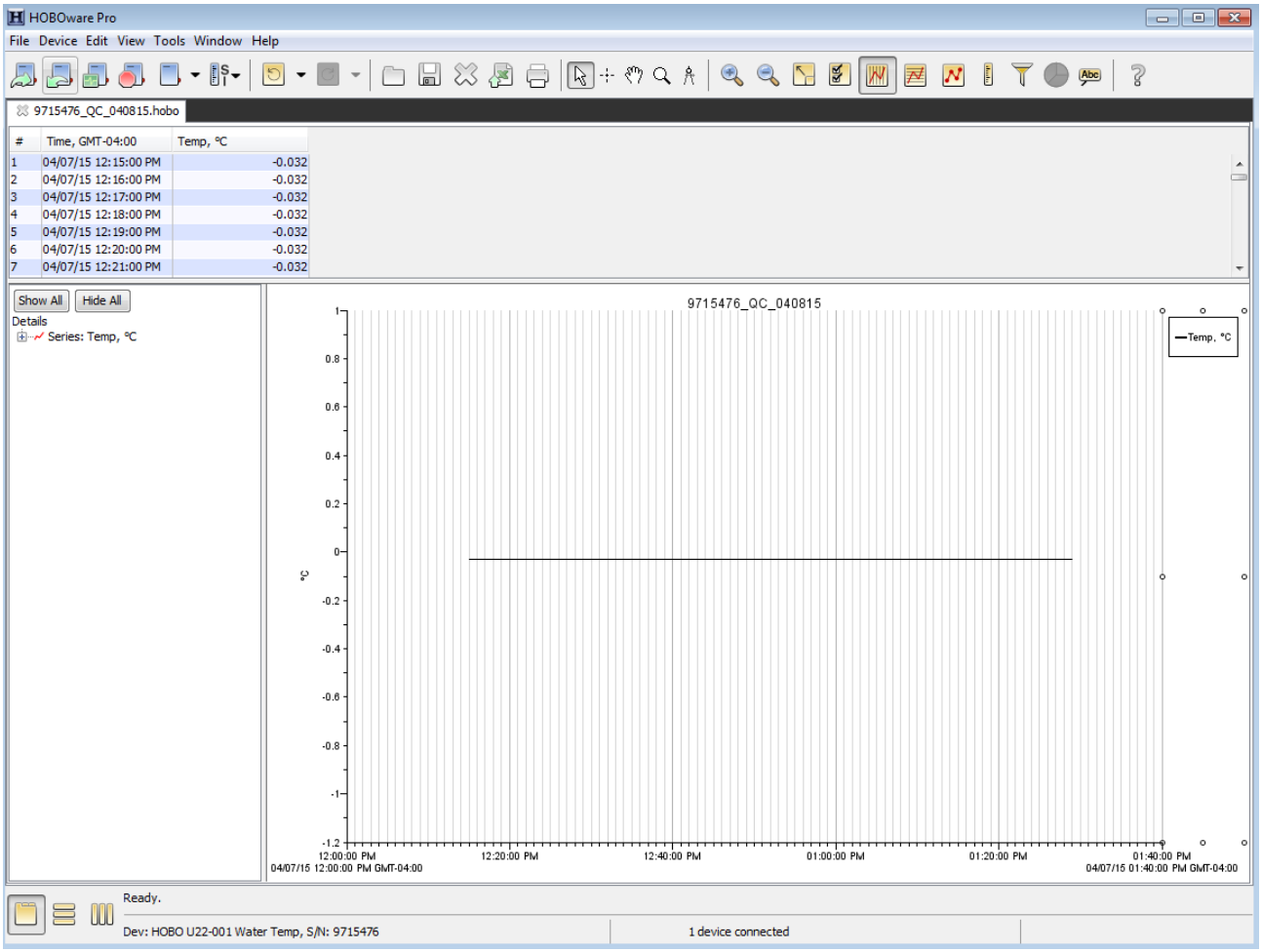


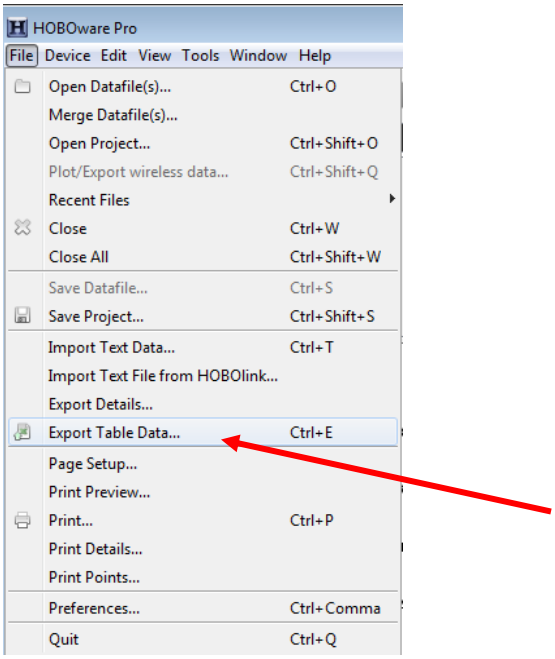
6. A "Save" pop-up window will open. Save the QC data file to the folder you created in step 8.2. The File name should default to the Description you entered during step 3.5.e; if not name the file "[Serial Number]_QC_[DDMMYY]". Select .hobo as the file type if it is not the default.
7. A "Plot Setup" pop-up window will open. (Check that the description is the same as the description you entered in step 3.5.e and the file name in step 6 above.)
    a. Make sure the "Temp" series is selected and the units set to "C." (If the "Batt" series is checked, uncheck it.)

b. Uncheck all events from the “Select Internal Logger Events to Plot” list.

c. Click “Plot”. A data table and plot of the QC data will open in the HOBOware window.

8. Select “Export Table Data” from the “File” menu to export the data as a .csv file. An “Export” pop-up window will appear; make sure the “Temp” series is checked and click “Export.” The default file name should be the same as the raw HOBO file (.hobo file) you named is step 8.6 above; save to the same location.



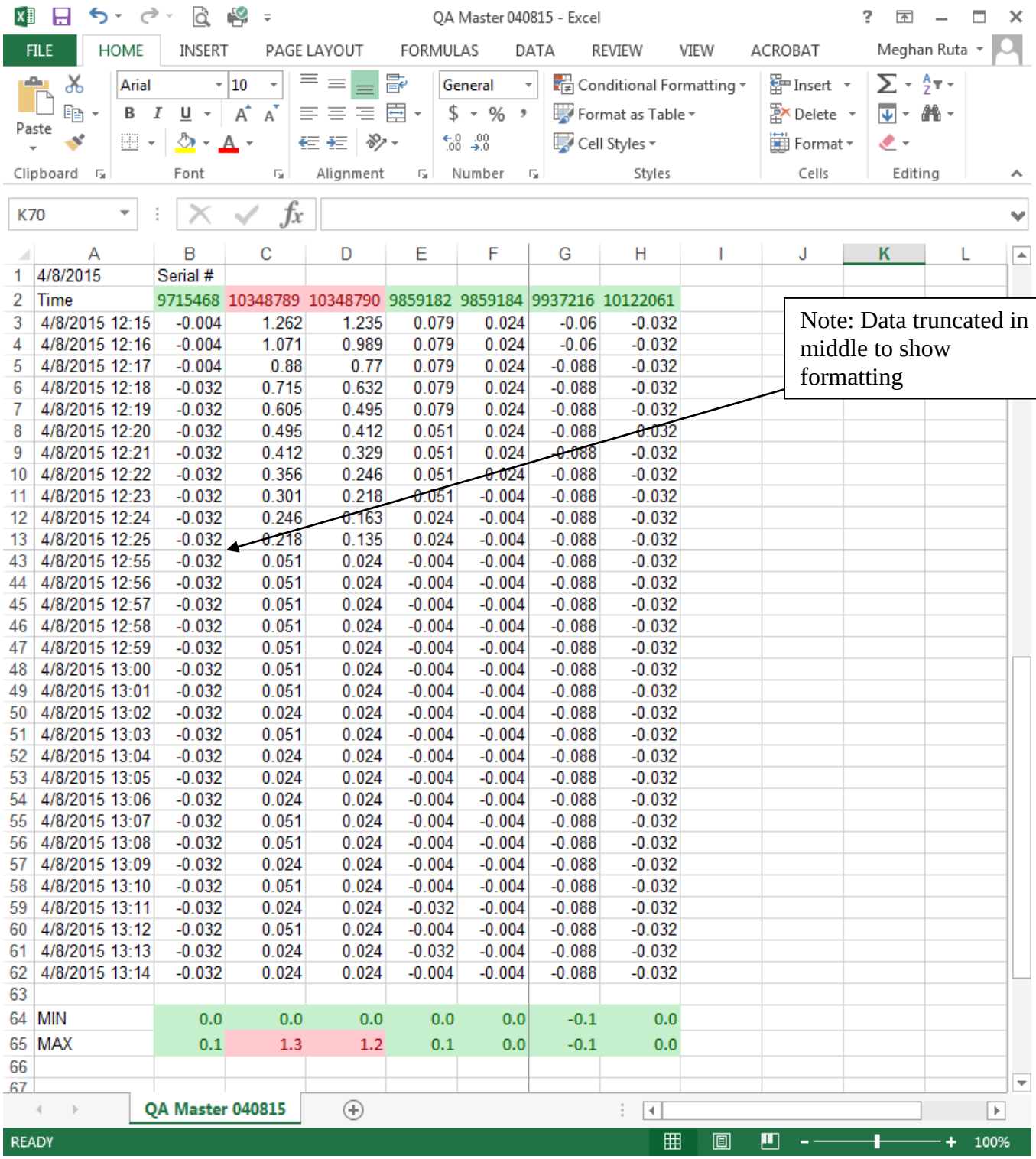


9. Repeat steps 8.3 through 8.8 above for any remaining loggers that were in the ice bath.

STEP 9: COMPILE THE QC .CSV FILES INTO AN EXCEL SPREADSHEET

1. Open Microsoft Excel; open a new workbook. Save the file as "QC [DDMMYY] Master File." (Example: QC 040815 Master File.xls). Save the file to the same folder as you saved the raw QC data files in Step 8 above.
    a. In cell 1A of the QC Master File enter the date of the QC check.
    b. In cell 1B type "Serial #"
    c. In cell 2A type "Time"
    d. In cell 2B type the serial number of the first logger recorded on your QC log.
2. Starting with the first logger listed on your QC log, open the saved .csv file. The file should include a Plot Title in the upper left with the file name you entered in step 8. Colum A will contain reading numbers starting with #1, column B should contain date/time, and column C should contain temperature readings in degrees Celsius.
    a. Note: If using an older version of Excel you may be prompted to interpret the delimitation of the .csv file. Select "Delimited" and click "Next". Check "Comma" off and click "Next" again. Click "Finish." When asked where do you want to put the data select "Existing Worksheet" and type "=$A$1" (no quotation marks) in the box. Click "OK"
3. Highlight and copy the date/time and temperature values in column B and C for the first 60 readings in the .csv file. Click on cell A3 in the QC Master File and paste the copied data. Save the QC Master file and close the .csv file for the first logger.
4. Open the .csv file for the second logger on your QC Log. Check to insure the first date/time are the same as the first date/time in the QC Master File. Type the serial number of the logger into cell C2. Highlight and copy the first 60 readings in the .csv file and paste to cell C3 of the Master File. Save the Master file and close the .csv file.

5. Repeat step 9.4 for each remaining logger on the QC log. Enter the logger serial number in row 3 of the Master File and copying the corresponding temperature readings from the .csv file to the cell in row 4 beneath the serial number. Save the Master file; close any open .csv files.



	A	B	C	D	E	F	G	H
1	4/8/2015	Serial #						
2	Time	9715468	10348789	10348790	9859182	9859184	9937216	10122061
3	4/8/2015 12:15	-0.004	1.262	1.235	0.079	0.024	-0.06	-0.032
4	4/8/2015 12:16	-0.004	1.071	0.989	0.079	0.024	-0.06	-0.032
5	4/8/2015 12:17	-0.004	0.88	0.77	0.079	0.024	-0.088	-0.032
6	4/8/2015 12:18	-0.032	0.715	0.632	0.079	0.024	-0.088	-0.032
7	4/8/2015 12:19	-0.032	0.605	0.495	0.079	0.024	-0.088	-0.032
8	4/8/2015 12:20	-0.032	0.495	0.412	0.051	0.024	-0.088	-0.032
9	4/8/2015 12:21	-0.032	0.412	0.329	0.051	0.024	-0.088	-0.032
10	4/8/2015 12:22	-0.032	0.356	0.246	0.051	0.024	-0.088	-0.032
11	4/8/2015 12:23	-0.032	0.301	0.218	0.051	-0.004	-0.088	-0.032
12	4/8/2015 12:24	-0.032	0.246	0.163	0.024	-0.004	-0.088	-0.032
13	4/8/2015 12:25	-0.032	0.218	0.135	0.024	-0.004	-0.088	-0.032
43	4/8/2015 12:55	-0.032	0.051	0.024	-0.004	-0.004	-0.088	-0.032
44	4/8/2015 12:56	-0.032	0.051	0.024	-0.004	-0.004	-0.088	-0.032
45	4/8/2015 12:57	-0.032	0.051	0.024	-0.004	-0.004	-0.088	-0.032
46	4/8/2015 12:58	-0.032	0.051	0.024	-0.004	-0.004	-0.088	-0.032
47	4/8/2015 12:59	-0.032	0.051	0.024	-0.004	-0.004	-0.088	-0.032
48	4/8/2015 13:00	-0.032	0.051	0.024	-0.004	-0.004	-0.088	-0.032
49	4/8/2015 13:01	-0.032	0.051	0.024	-0.004	-0.004	-0.088	-0.032
50	4/8/2015 13:02	-0.032	0.024	0.024	-0.004	-0.004	-0.088	-0.032
51	4/8/2015 13:03	-0.032	0.051	0.024	-0.004	-0.004	-0.088	-0.032
52	4/8/2015 13:04	-0.032	0.024	0.024	-0.004	-0.004	-0.088	-0.032
53	4/8/2015 13:05	-0.032	0.024	0.024	-0.004	-0.004	-0.088	-0.032
54	4/8/2015 13:06	-0.032	0.024	0.024	-0.004	-0.004	-0.088	-0.032
55	4/8/2015 13:07	-0.032	0.051	0.024	-0.004	-0.004	-0.088	-0.032
56	4/8/2015 13:08	-0.032	0.051	0.024	-0.004	-0.004	-0.088	-0.032
57	4/8/2015 13:09	-0.032	0.024	0.024	-0.004	-0.004	-0.088	-0.032
58	4/8/2015 13:10	-0.032	0.051	0.024	-0.004	-0.004	-0.088	-0.032
59	4/8/2015 13:11	-0.032	0.024	0.024	-0.032	-0.004	-0.088	-0.032
60	4/8/2015 13:12	-0.032	0.051	0.024	-0.004	-0.004	-0.088	-0.032
61	4/8/2015 13:13	-0.032	0.024	0.024	-0.032	-0.004	-0.088	-0.032
62	4/8/2015 13:14	-0.032	0.024	0.024	-0.004	-0.004	-0.088	-0.032
63								
64	MIN	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
65	MAX	0.1	1.3	1.2	0.1	0.0	-0.1	0.0
66								
67								

STEP 10: CALCULATE MAXIMUM AND MINIMUM VALUES FOR LOGGER QC DATA

1. In cell A64 type "MIN"; in cell A65 type "MAX".
2. Click on cell B64 and type "=MIN(B3:B62)" (do not type quotation marks); hit Enter.
3. Click on cell B65 and type "=MAX(B3:B62)" (do not type quotation marks); hit Enter.
4. Highlight cells B64 and cell B65. Left-click on the green box in the lower right of the highlighted cells and drag it to the right to copy the formulas to any remaining logger data columns in the worksheet.
5. Examine the minimum and maximum values for each logger.
    a. Highlight any cells in row 64 (minimum values) that are less than -0.2C. Scroll to the top of the corresponding data column of any highlighted minimum value cells and highlight the logger serial number. Check "No" in the "QC Pass?" column of the QC Log for this logger and write "Fail #1" in the Comments column.
    b. Highlight any cells in row 65 (maximum values) that are greater than 0.2C. Scroll to the top of the corresponding data column of any highlighted minimum value cells and highlight the logger serial number. Check "No" in the "QC Pass?" column of the QC Log for this logger and write "Fail #1" in the Comments column.
    c. For all remaining loggers on the QC log check "Yes" under the "QC Pass? "column. (These loggers had readings that were all within the range of -0.2C to 0.2C.)

STEP 11: REPEAT THE QC CHECK FOR ANY LOGGERS THAT DID NOT PASS THE QC CHECK

1. Any loggers that did not pass the initial QC check must be rechecked before they can be considered acceptable to use for stream temperature data collection. If a logger failed the initial QC check it must pass two subsequent QC checks to be considered passing and usable. Any possible reasons for the initial QC check fail should be noted on the QC log.
2. Loggers that fail a second QC check should be removed from circulation and returned to Onset (if desired) for evaluation. (Note "Fail #2" in the comments column of the QC Log for the logger's second QC check.)

CT DEEP Volunteer Stream Temperature Monitoring Program

EXAMPLE

Temperature Data Logger QC Log - 2015 Volmon

Pg # 1 of 1

Logger Serial #	Logger Type	Date	Battery State	Launch/Start Time & Temp	Mid QC Time & Temp	End Time & Temp	QC Pass? Yes	QC Pass? No	Initials	Comments
9715468	ProV2	4/8/15	Good	12:15 0.0C	12:45 0.0C	13:15 0.0C	✓		ML	
10348789	ProV2	4/8/15	Good	12:15 0.0C	12:45 0.0C	13:15 0.0C		✓		1st Fail
10348790	ProV2	4/8/15	Good	12:15 0.0C	12:45 0.0C	13:15 0.0C		✓		1st Fail
9859182	ProV2	4/8/15	Good	12:15 0.0C	12:45 0.0C	13:15 0.0C	✓			
9859184	ProV2	4/8/15	Good	12:15 0.0C	12:45 0.0C	13:15 0.0C	✓			
9937216	ProV2	4/8/15	Good	12:15 0.0C	12:45 0.0C	13:15 0.0C	✓			
10122061	ProV2	4/8/15	Good	12:15 0.0C	12:45 0.0C	13:15 0.0C	✓			
10348789	ProV2	4/10/15	Good	10:00 0.0C	10:30 0.0C	11:00 0.0C	✓			
10348790	ProV2	4/10/15	Good	10:00 0.0C	10:30 0.0C	11:00 0.0C		✓		Fail #2

LOGGER DELAYED LAUNCH

Equipment Needed:

- HOBO Prov2 water temperature logger
- Computer with HOBOware Pro and Microsoft Excel software installed
- HOBO waterproof shuttle or Optic USB Base Station
- HOBO Prov2 coupler for shuttle/base station

Launch Notes:

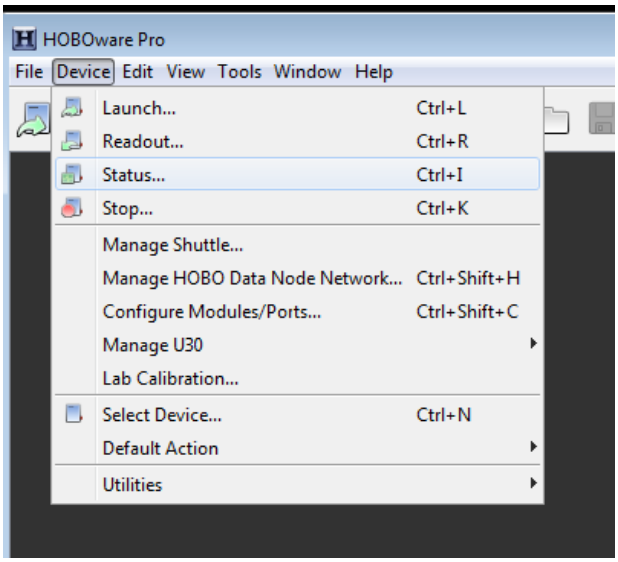
- If pre-calibration for the logger is within acceptable tolerance of the logger (i.e. +/- 0.2C), program the logger for field deployment.
- It is a good practice to set the delayed start date and time with enough buffer to ensure that the first reading is a stable water temperature measurement.

STEP 1: UPDATE YOUR HOBOWARE SOFTWARE

1. Be certain to have the latest version of HOBOware® software. You can check for the latest version www.onsetcomp.com.

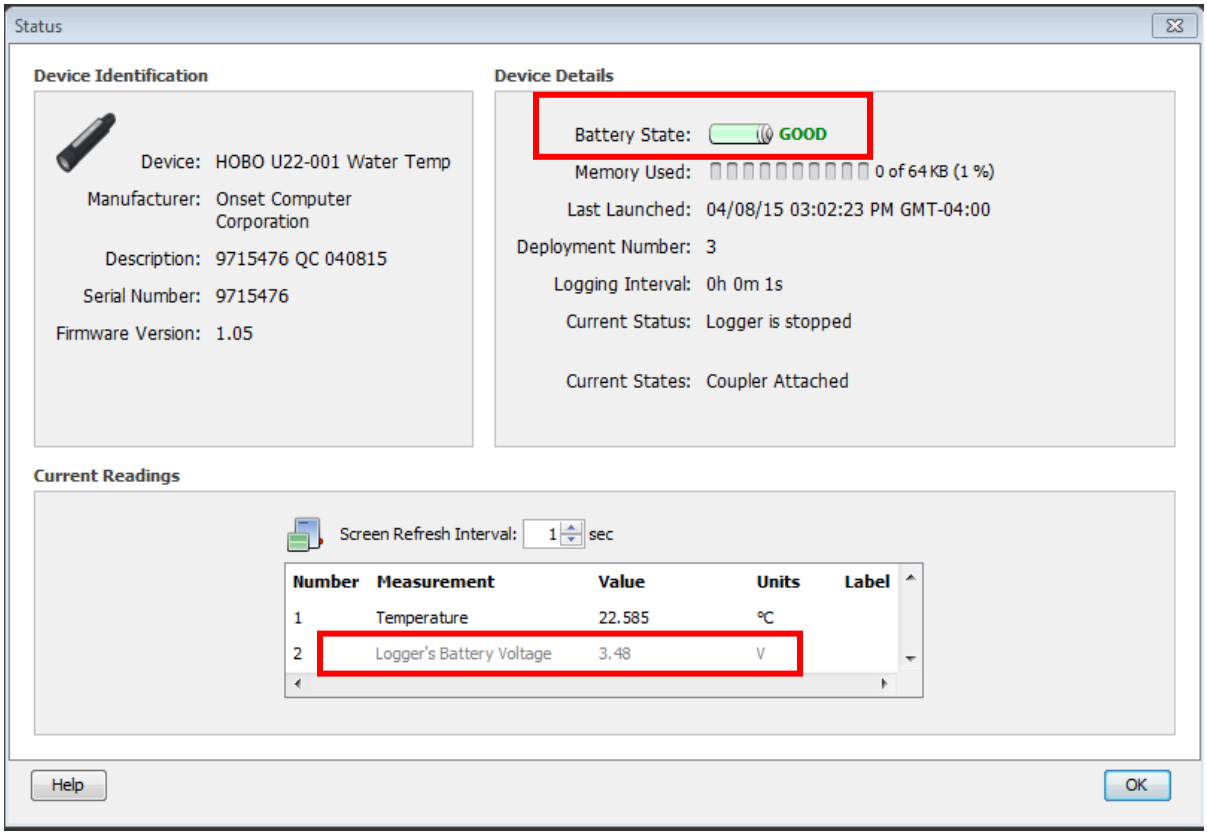
STEP 2: CHECK THE LOGGER BATTERY STATUS

1. Open HOBOware Pro on your computer. Using the coupler, attach the logger to the base station/shuttle and wait for the "1 device connected" message to appear in the lower right of the HOBOware window.
2. Select 'Status' from the 'Device' menu. The 'Select Device" pop-up window will open – select the HOBO logger from the list and click "OK."



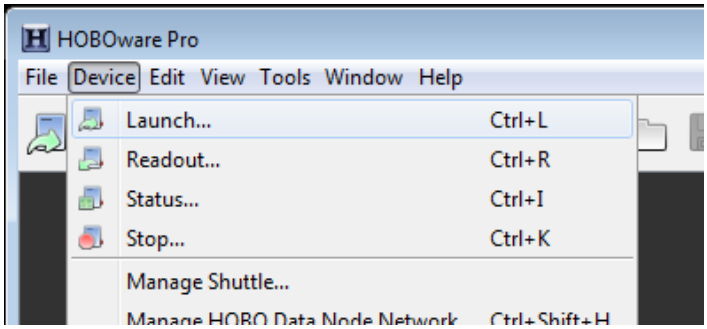
3. The "Status" pop-up window will open and display device identification, details, and current readings for the attached logger. Check to make sure the Battery State is "Good" and the battery voltage is greater than 3.3V. Click "OK" to close the window.

a. *NOTE: The battery in the HOBO® Water Temp Pro v2 is a 3.6 V lithium battery. If the battery falls below 3.1 V, the logger will record a "bad battery" event in the data file. If the data file contains "bad battery" events, or if logged battery voltage repeatedly falls below 3.3 V, the battery is failing and the logger should be returned to Onset® for battery replacement.*



STEP 3: SCHEDULE THE LOGGER TO LAUNCH

1. Select 'Launch' from the 'Device' menu. The 'Select Device" pop-up window will open – select the HOBO logger from the list and click "OK."



2. The "Launch Logger" pop-up window will open.

a. In the Description field enter the name of the file that will store the data that the logger is to record while out in the field. The following naming convention is preferred by DEEP: "[Serial Number] [Season] [Year] Deployment"

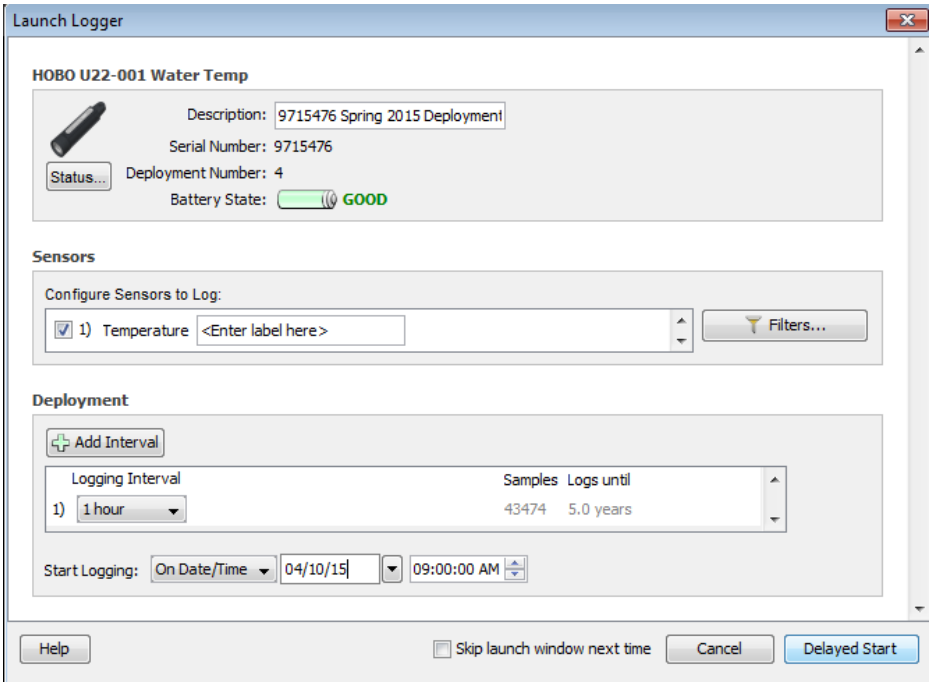
   i. *NOTE: Do not include any site information when naming the logger file; this will insure a logger can be used at any monitoring location and avoids the possibility of accidentally placing a logger at the wrong site (i.e. at a site other than that which is in the file name).*

b. Make sure the "Temperature" sensor is checked off.

c. Set the logging interval to 1 hour.

d. Select "On Date/Time" from the "Start Logging" drop down menu. Enter the date and time that you would the logger to start recording data.

   i. *NOTE: To prevent erroneous data at the start of the logger dataset, it is recommended that you set the date/time to be at least several hours after you plan to place the logger into the stream. This will allow the logger sensor to adjust to in stream conditions prior to logging data. For example if you plan to set the logger out on a Saturday morning, it is recommended that you set the logger to start recording that evening or the next day.*



e. A "Launching Logger" status bar may appear. When the logger is launched a "Launch successful" message will appear in the bottom left of your screen.

3. Repeat steps 3.1 and 3.2 above for any additional loggers that need to be launched.

LOGGER DEPLOYMENT

Equipment Needed:

- One Per Monitoring Site:
    a. Stream temperature logger (1 per site)
    b. PVC tube with holes drilled – 4 holes around each end and two pairs of holes in the center
    c. Heavy metal plate or other field weight (>10 lbs)
    d. Monitoring Site Log & Field Data Sheet (Appendix B)
- Medium-sized Zip ties
- Digital camera (or smart phone)
- GPS Unit (or smart phone)
- Surveyor's flagging
- Pencils

STEP 1: SECURE THE LOGGER IN THE LOGGER HOUSING

1. Before securing your logger in its housing, begin a new Monitoring Site Log & Field Data Sheet (Appendix B); complete the "Site & Logger Details" section:
    a. Record the Volunteer Group Information:
        i. Record the name of the organization or group overseeing the stream monitoring program that you are volunteering for (e.g. Volunteer Group Name).
        ii. Record the name and phone number of the individual coordinating the volunteer group's overall stream temperature monitoring program (i.e. the Coordinator).
    b. Record the Site Information:
        i. Record the Stream Name in the "Stream" field.
        ii. Leave the site number field blank; the volunteer program coordinator will assign each monitoring site a unique site number for tracking purposes.
            - For example, the Hop River Watershed Association might assign their 2015 monitoring locations on the Hop River HR-1, HR-2, etc.
        iii. Record the town in which the monitoring site is located
        iv. Provide a written description (Site Location) of the monitoring site. The site location description should be filled in with a narrative description of the logger location. This description should be detailed enough to allow another individual *who is unfamiliar with the area and the site* to use a map to locate the stretch of river that the logger is located in. Include relevant nearby landmarks such as road intersections, businesses, telephone pole numbers, house addresses, etc. This description will be used by DEEP to assign your monitoring site a location in the DEEP database.
        v. Use a GPS unit or smart phone to collect and record the GPS location of your monitoring site. (Note the location does not need to be the exact location of the logger but an approximation of its location on the given stream reach.)
    c. Record the Logger Details:

i. Record the logger serial number and type (ProV2 HOBO). NOTE: Read the serial number directly from the logger; if forms were filled out in advance, check that the logger serial number on the form matches that of the logger you are about to deploy in the stream.

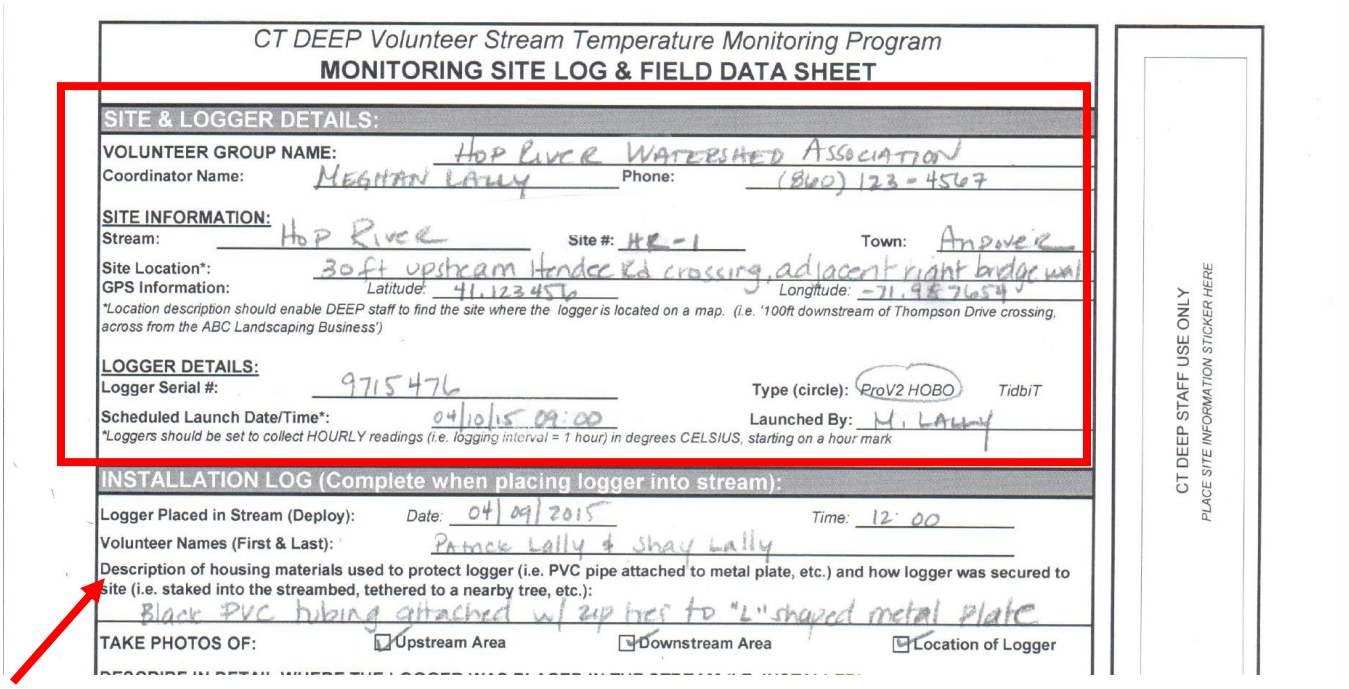
ii. Record the scheduled launch date and time, and note who performed the launch.

d. Secure the logger inside the PVC tube by inserting the logger inside the tube. Using a zip tie, loop the tie through one of the center holes in the tube, then through the tab on the logger, and then back out the second center hole in the tube. Secure the tip tie firmly. Loop a second zip tie through the tube around the bottom end of the probe and secure firmly.

2. Secure the PVC tube (with logger now firmly secured within) to a heavy weight (i.e. metal plate, window weights, or other heavy metal object) using additional zip ties and cable/parachute cord if needed.


Examples of loggers secured within PVC tube using zip ties and then attached to a heavy metal weight. Shown is a railroad tie (left) and old window weights (right).

3. Provide a description of the housing materials (e.g. "Black PVC tubing attached to metal plate") in the space provided in the "Installation Log" section of the Monitoring Site Log & Field Data Sheet.



CT DEEP Volunteer Stream Temperature Monitoring Program
MONITORING SITE LOG & FIELD DATA SHEET

SITE & LOGGER DETAILS:

VOLUNTEER GROUP NAME: Hop River Watershed Association
Coordinator Name: Meghan Lally Phone: (860) 123-4567

SITE INFORMATION:
Stream: Hop River Site #: HR-1 Town: Ampoir
Site Location*: 30ft upstream Hendee Rd crossing, adjacent right bridge wal
GPS Information: Latitude: 41.123456 Longitude: -71.987654
*Location description should enable DEEP staff to find the site where the logger is located on a map. (i.e. '100ft downstream of Thompson Drive crossing, across from the ABC Landscaping Business')

LOGGER DETAILS:
Logger Serial #: 9715476 Type (circle): ProV2 HOBO TidbiT
Scheduled Launch Date/Time*: 04/10/15 09:00 Launched By: M. Lally
*Loggers should be set to collect HOURLY readings (i.e. logging interval = 1 hour) in degrees CELSIUS, starting on a hour mark

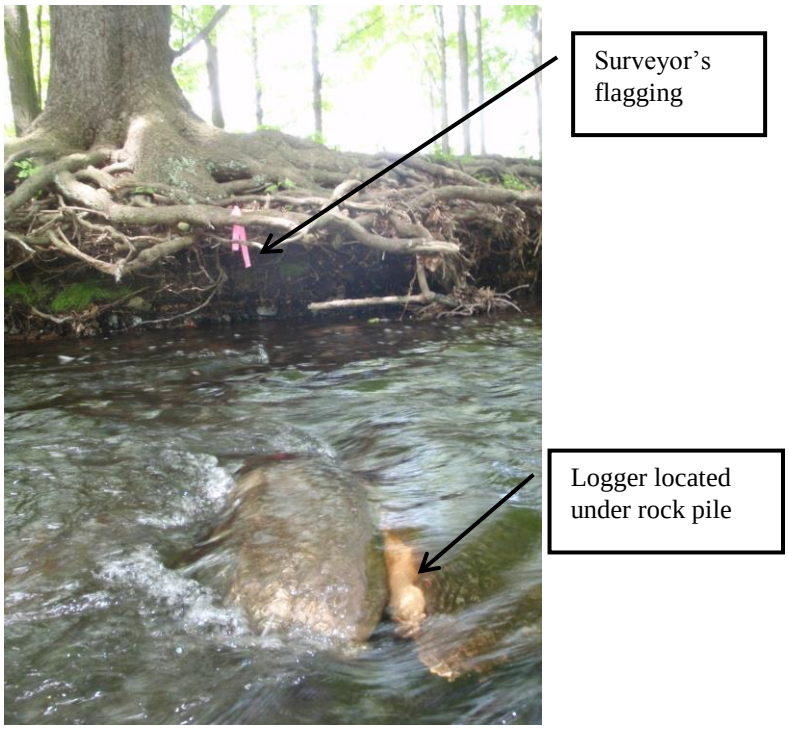
INSTALLATION LOG (Complete when placing logger into stream):

Logger Placed in Stream (Deploy): Date: 04/09/2015 Time: 12:00
Volunteer Names (First & Last): Patrick Lally & Shay Lally
Description of housing materials used to protect logger (i.e. PVC pipe attached to metal plate, etc.) and how logger was secured to site (i.e. staked into the streambed, tethered to a nearby tree, etc.):
Black PVC tubing attached w/ zip ties to "L" shaped metal plate
TAKE PHOTOS OF: ☑ Upstream Area ☑ Downstream Area ☑ Location of Logger

CT DEEP STAFF USE ONLY
PLACE SITE INFORMATION STICKER HERE

STEP 2: LOCATE YOUR INSTALLATION SITE

1. Identify where exactly you will place the logger on the stream bottom.
    a. Locate an area at your site that is unlikely to be highly trafficked by the public, or if this is not possible, that will not be highly visible to the public.
    b. Select an area that is in a deeper hole or run (not too deep – you need to be able to retrieve the logger!) or that is unlikely to go dry during the low-flow summer period. The location should be in an area of the stream that will remain wet throughout the summer – avoid the edges of shallow streams and sand/gravel bars.
2. Remove all large substrate from the point where you will be placing the logger.
3. Place the logger/housing/weight setup on the stream bottom so that the PVC tube is oriented to allow water to flow through both ends of the tube.
4. Build a rock enclosure around the HOBO by placing large rocks around and over the HOBO housing. Place the rocks carefully to avoid dropping rocks onto the HOBO housing; not doing so could result in a broken logger. Build up the enclosure enough to protect the HOBO without unnecessarily drawing attention to the location. (This will both protect the logger from movement during high flow events and shield it from sunlight while in the stream.)
5. Use surveyor's flagging to mark the stream bank on one or both sides of the logger to help locate the logger as needed while deployed or during retrieval. (Use discretion if placing a logger in a highly trafficked area – you may need to strategically place your flagging so that you can later locate your logger but so that it will not direct a curious visitor directly to the logger during your absence.)



STEP 3: TAKE SITE PHOTOS

1. Take a photo standing at the logger location and facing upstream. (When facing upstream you will be facing the direction that the water is flowing from.) Try to capture as much of the surrounding stream banks and land use as possible. Check off on the field data form that you took an 'Upstream Area' photo.
2. Remain at the logger location and turn 180 degrees so that you are facing downstream. (When facing downstream you will be facing the direction that the water is flowing towards.) Take a photo of the downstream area, again trying to capture as much of the surrounding stream banks and land use as possible. Check off on the field data form that you took a 'Downstream Area' photo.
3. Take additional photos of the logger location.
    a. It is recommended that you take at least one photo of a volunteer standing next to the logger pointing down at the logger.
    b. Try to capture any unique features mentioned in the site description or area map when taking photos. The photos should be taken from a far enough distance to capture nearby landscape features and flagging so as to help other volunteers (or you) locate the logger in several months when you return to download the data or retrieve it.
    c. Consider taking the photos from the direction that you will be approaching the stream when you return to check on or retrieve the logger.
    d. Refer to Appendix C for additional photo guidance.
    e. When done, check off on the field data form that you took 'Location of Logger' photos.

An example (c) photo showing the location of a logger that was just installed at a site in the field.

STEP 4: COMPLETE THE "DATA LOGGER INSTALLATION/RETRIEVAL FORM"

1. Complete the remaining portions of the "Installation Log" section of your datasheet:
    a. Record the date and time that the logger was placed in the water/stream.
    b. Record the full names (first and last) of all volunteers that are in the field deploying the logger.
    c. The description of logger housing materials should have been recorded in Step 1.1 above.
    d. The photo boxes should have been checked off in Step 1.3 above.
    e. Provide a detailed description of where the logger is located within the stream to help volunteers locate the logger in the future. Note how far it is and in what direction from easily identified features such as large boulders or trees, road crossings, or other unique landscape features.
    f. Sketch a map of the stream reach in which the logger was deployed. Be sure to note the position of the logger as well as any landscape features noted in your written description of where the logger is located.

CT DEEP Volunteer Stream Temperature Monitoring Program
MONITORING SITE LOG & FIELD DATA SHEET

SITE & LOGGER DETAILS:

VOLUNTEER GROUP NAME: Hop River Watershed Association
Coordinator Name: Meghan Lally **Phone:** (860) 123-4567

SITE INFORMATION:
Stream: Hop River **Site #:** HR-1 **Town:** Andover
Site Location*: 30ft upstream Hendee Rd crossing, adjacent right bridge wall
GPS Information: Latitude: 41.1234567 Longitude: -71.9876543
"Location description should enable DEEP staff to find the site where the logger is located on a map. (i.e. '100ft downstream of Thompson Drive crossing, across from the ABC Landscaping Business')

LOGGER DETAILS:
Logger Serial #: 9715476 **Type (circle):** (ProV2 HOBO) TidbiT
Scheduled Launch Date/Time*: 04/10/15 09:00 **Launched By:** M. Lally
"Loggers should be set to collect HOURLY readings (i.e. logging interval = 1 hour) in degrees CELSIUS, starting on a hour mark

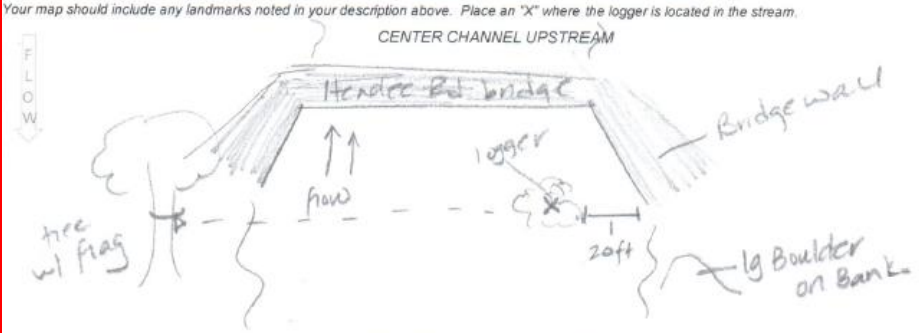
INSTALLATION LOG (Complete when placing logger into stream):

Logger Placed in Stream (Deploy): Date: 04/09/2015 Time: 12:00
Volunteer Names (First & Last): Patrick Lally & Shay Lally
Description of housing materials used to protect logger (i.e. PVC pipe attached to metal plate, etc.) and how logger was secured to site (i.e. staked into the streambed, tethered to a nearby tree, etc.):
Black PVC tubing attached w/ zip ties to "L" shaped metal plate

TAKE PHOTOS OF: ☑ Upstream Area ☑ Downstream Area ☑ Location of Logger

DESCRIBE IN DETAIL WHERE THE LOGGER WAS PLACED IN THE STREAM (I.E. INSTALLED).
(Refer to unusual or easily identified nearby features when possible to help other volunteers locate the logger during retrieval.)
Adjacent right bridge wing wall (facing downstream) under large rock pile. Approximately 20 ft from wall/stream edge. Flagging on tree directly across stream

SKETCH A MAP OF THE AREA WHERE THE LOGGER WAS PLACED IN THE STREAM.
Your map should include any landmarks noted in your description above. Place an "X" where the logger is located in the stream.



CENTER CHANNEL DOWNSTREAM

FIELD TEMPERATURE CHECKS

Date	Time	Temp (°C)	Volunteer Name	Date	Time	Temp (°C)	Volunteer Name
05/15/15	13:00	15.9	P. Lally	9/15/15	8:00	19.2	S. Lally

CT DEEP STAFF USE ONLY
PLACE SITE INFORMATION STICKER HERE

OLMON COORDINATOR USE ONLY
Post-Retrieval QC Check:
QC Date: 04/03/16
QC By: Meghan Lally
QA Result (Pass/Fail): Pass

FIELD TEMPERATURE CHECKS

Equipment Needed:

- Monitoring Site Log & Field Data Sheet (with deployment information)
- Digital camera
- Pencil
- Thermometer

Field temperature checks are not required by CT DEEP but do serve as a valuable quality control check on your logger data. Field checks also provide a valuable opportunity to check on your logger to make sure field conditions have not changed since the logger was first deployed (i.e. the logger is still submerged during low flow period, the logger has not been moved or tampered with, etc.). If volunteer groups have the resources to do so, it is recommended that field temperature checks be conducted once per month while the logger is deployed. CT DEEP suggests that groups conduct a minimum of one check during deployment, especially for sites being monitored for the first time. (There is no recommended maximum for the number of field checks; the more the better!)

IMPORTANT NOTE: The goal of the field temperature check is to collect a manual reading to compare to the data logger reading. The data logger was programmed to record temperature at hourly intervals (e.g. 12:00, 13:00, 14:00, etc.). Stream temperature can vary significantly over the course of an hour (i.e. from 12:00 to 13:00); therefore the most valuable field temperature checks will be those that are conducted on or near an hour mark (i.e. on or near a logger data point.)

STEP 1: LOCATE YOUR LOGGER & TAKE SITE CONDITION PHOTOS

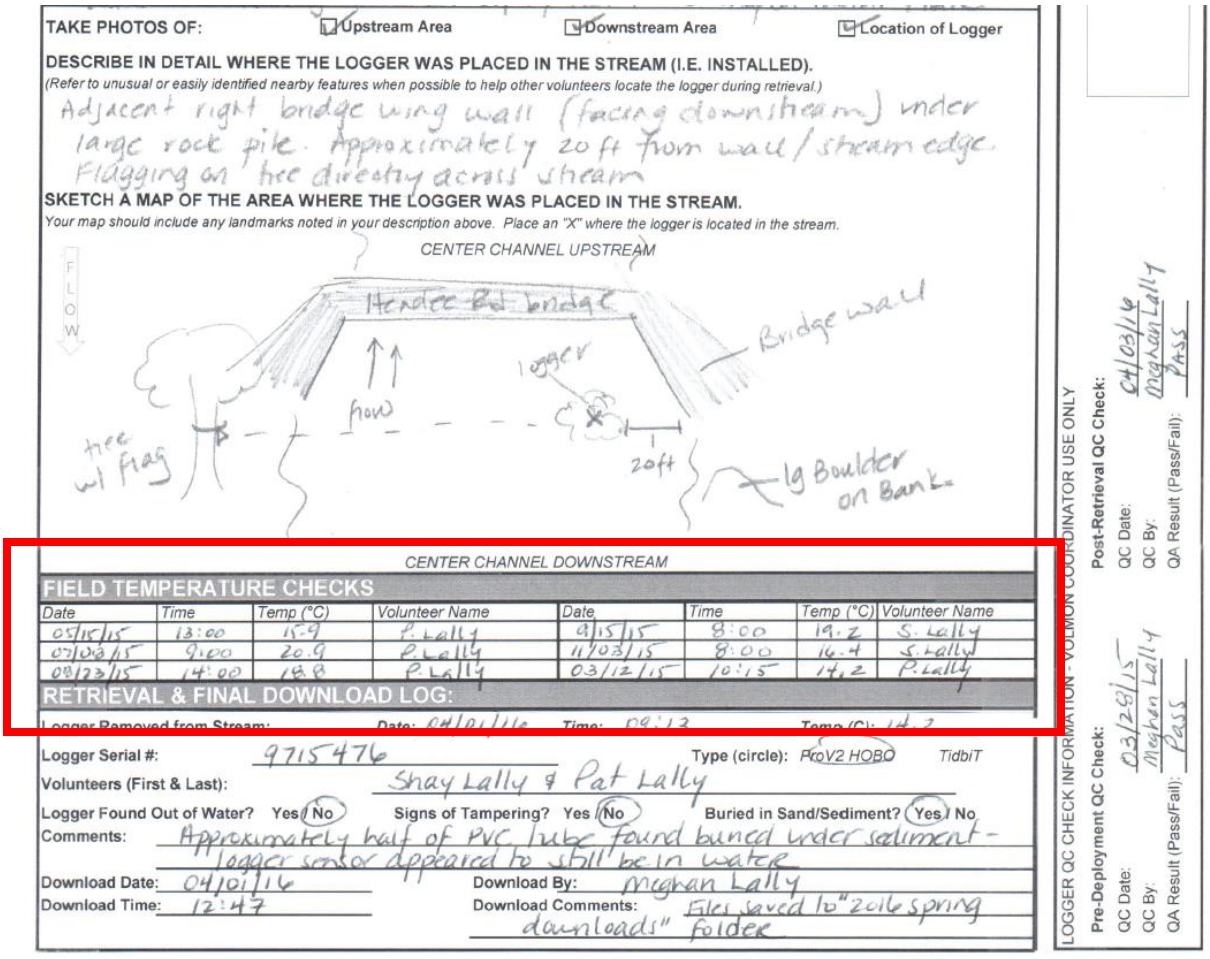
1. Use the Monitoring Site Log & Field Data Sheet that was completed during logger deployment along with the logger deployment site photographs, to locate your stream logger.
    a. *NOTE: If any site conditions have changed since the logger was first deployed, be sure to update the descriptions and map on the Monitoring Site Log & Field Data Sheet to reflect these changes. This will assist with locating the logger for retrieval.*
2. Following the guidance in Appendix C, take photographs to document the upstream conditions, downstream conditions, and logger location during the time of your field temperature check.

STEP 2: TAKE A MANUAL STREAM TEMPERATURE READING

1. Without disturbing the logger or the surrounding rock pile, place the field thermometer in the stream, underwater and as close to the logger as possible.
    a. Take care that your hand is not touching the thermometer probe and that you are standing to the side or downstream of the thermometer so as not to influence the flow or temperature of the water passing by the thermometer.
    b. The thermometer should be held within the water column and not be allowed to sit on the stream bottom or touch any materials in the stream (e.g. rocks, woody debris).
2. Wait 30 seconds, or longer if needed, to allow the thermometer reading to stabilize.

a. NOTE: stream temperature will vary slightly across the water column so it is unlikely that your temperature will reach a single constant value; wait until the thermometer displays shifts in temperature within 0.2C of each or less.

3. In the "Field Temperature Checks" section of your datasheet, record:
   a. The date and time of the manual temperature reading (to the nearest minute)
   b. The manual temperature reading (in degrees Celsius to the nearest 0.1C)
   c. The name of the volunteer(s) that conducted the field temperature check.



TAKE PHOTOS OF: ☑ Upstream Area ☑ Downstream Area ☑ Location of Logger

DESCRIBE IN DETAIL WHERE THE LOGGER WAS PLACED IN THE STREAM (I.E. INSTALLED).
(Refer to unusual or easily identified nearby features when possible to help other volunteers locate the logger during retrieval.)
Adjacent right bridge wing wall (facing downstream) under large rock pile. Approximately 20 ft from wall / stream edge. Flagging on tree directly across stream

SKETCH A MAP OF THE AREA WHERE THE LOGGER WAS PLACED IN THE STREAM.
Your map should include any landmarks noted in your description above. Place an "X" where the logger is located in the stream.

FIELD TEMPERATURE CHECKS

Date	Time	Temp (°C)	Volunteer Name	Date	Time	Temp (°C)	Volunteer Name
05/15/15	13:00	15.9	P. Lally	9/15/15	8:00	19.2	S. Lally
07/08/15	9:00	20.9	P. Lally	11/03/15	8:00	14.4	S. Lally
08/23/15	14:00	19.8	P. Lally	03/12/15	10:15	14.2	P. Lally

RETRIEVAL & FINAL DOWNLOAD LOG:

Logger Removed from Stream: Date: 04/01/16 Time: 09:13 Temp (C): 14.2

Logger Serial #: 9715476 Type (circle): ProV2 HOBO TidbiT

Volunteers (First & Last): Shay Lally & Pat Lally

Logger Found Out of Water? Yes / No Signs of Tampering? Yes / No Buried in Sand/Sediment? Yes / No

Comments: Approximately half of PVC tube found buried under sediment - logger sensor appeared to still be in water

Download Date: 04/01/16 Download By: Meghan Lally

Download Time: 12:47 Download Comments: Files saved to "2016 spring downloads" folder

LOGGER QC CHECK INFORMATION - VOLMON COORDINATOR USE ONLY

Pre-Deployment QC Check: QC Date: 03/29/15 QC By: Meghan Lally QA Result (Pass/Fail): Pass

Post-Retrieval QC Check: QC Date: 04/03/16 QC By: Meghan Lally QA Result (Pass/Fail): Pass

Send completed forms to: Meghan Lally, WPLR Monitoring Assessment Program, 79 Elm Street, Hartford, CT 06106-5127 or meghan.lally@ct.gov. Call 860-424-3061 with questions. Last revised 04/08/2015

LOGGER RETRIEVAL

Equipment Needed:

- Digital camera (or smartphone)
- GPS Unit (or smartphone)
- Pencils
- Monitoring Site Log & Field Data Sheet (with deployment and field check information)
- Wire cutters or heavy scissors
- Ziploc bags
- Manila tags
- Sharpie marker
- Cooler with ice

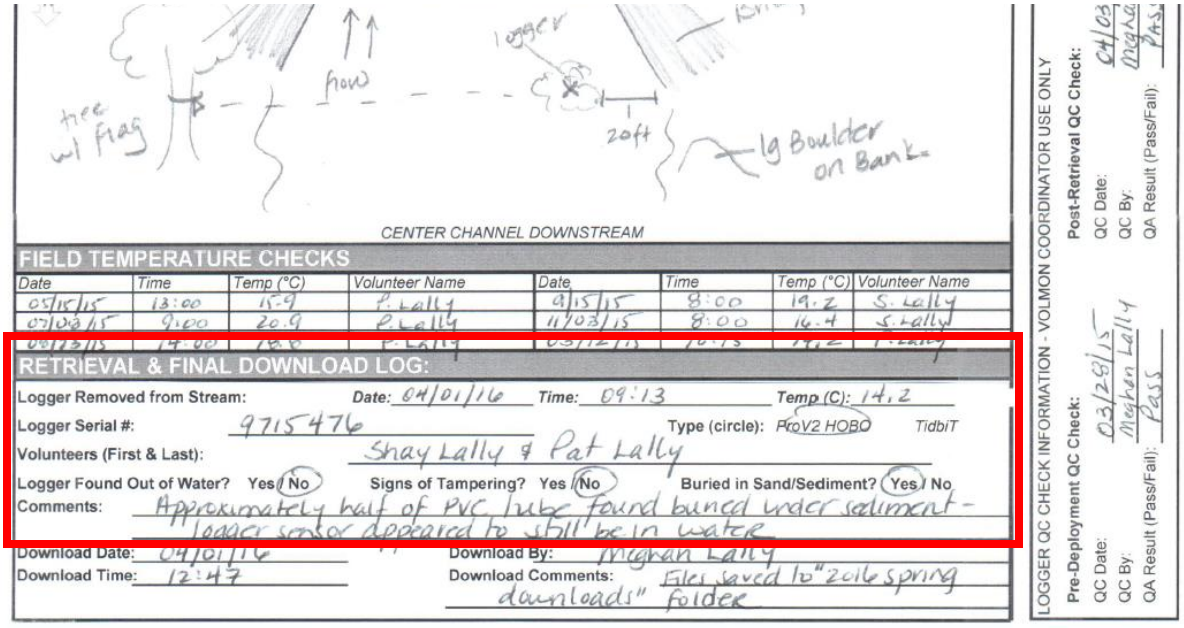
STEP 1: LOCATE YOUR LOGGER

1. Using the Monitoring Site Log & Field Data Sheet details and map along with your deployment site photographs (and field check photographs if applicable), locate your stream logger.
2. Check to see if the logger appears to be out of the water, buried in sediment, or otherwise disturbed; if so take a photograph of the logger as you found it before moving the logger.

STEP 2: TAKE A MANUAL FIELD TEMPERATURE READING & REMOVE LOGGER FROM STREAM

1. Without disturbing the logger, place the field thermometer in the stream, underwater and as close to the logger as possible.
    a. Take care that your hand is not touching the thermometer probe and that you are standing to the side or downstream of the thermometer so as not to influence the flow or temperature of the water passing by the thermometer.
    b. The thermometer should be held within the water column and not be allowed to sit on the stream bottom or touch any materials in the stream (e.g. rocks, woody debris).
2. Wait 30 seconds, or longer if needed, to allow the thermometer reading to stabilize.
    a. NOTE: stream temperature will vary slightly across the water column so it is unlikely that your temperature will reach a single constant value; wait until the thermometer displays shifts in temperature within 0.2C of each or less.
3. Remove the logger and protective housing from the stream.
4. Record the date, time and temperature on the Monitoring Site Log & Field Data Sheet at the top of the "Retrieval and Final Download Log" section.
5. Use a pair of wire cutters or heavy scissors to remove the logger from the protective housing. Check the logger serial number; record this number and the logger type on the datasheet.
    a. NOTE: DO NOT assume it is the same logger you deployed – check and record the actual number on the logger.
6. Record the names (first and last) of all volunteers involved in logger retrieval.

7. Indicate (yes/no) whether the logger was found a) out of the water, b) buried in sand/sediment, or c) otherwise tampered with. If you answered yes to any of these provide additional information in the comments section of the datasheet.
8. If you have a waterproof shuttle (or brought a laptop with you to the monitoring location) download the logger data to your shuttle/laptop and record the download information (i.e. date, time, by, comments) on the datasheet.



STEP 4: LABEL AND PACKAGE YOUR LOGGER FOR LATER DOWNLOAD

1. Attach a manila tag to the logger. Use a sharpie marker to record the following information on the label:
    a. The stream name and monitoring location description
    b. The logger serial number and type (read directly from the logger not your datasheet)
    c. The date and time the logger was removed (Should correspond with what you recorded on the datasheet)
    d. The name of the individual(s) that retrieved the logger
2. Place the labelled logger into a plastic zip lock bag and place it into your cooler with ice for transport back to your lab/office.

STEP 5: TAKE UPSTREAM AND DOWNSTREAM SITE PHOTOGRAPHS

1. To document flow and site conditions at the time of logger removal, stand at the location where you removed the logger, and take a photograph facing upstream and then a second facing downstream. (Refer to Appendix C for site photograph guidance.) .

LOGGER DOWNLOAD

Equipment Needed:

- Monitoring Site Log & Field Data Sheet (with deployment and retrieval information)
- HOBO Prov2 water temperature logger
- Computer with HOBOware Pro and Microsoft Excel software installed
- HOBO waterproof shuttle or Optic USB Base Station
- HOBO Prov2 coupler for shuttle/base station

Download Notes:

- To avoid data loss, it is recommended that loggers be downloaded as soon as possible after retrieval.
- Loggers that were launched using a new version of software than the one used to attempt download may give a "logger header corrupt" or similar error message. Prior to downloading, be certain to have the latest version of HOBOware® software. You can check for the latest version www.onsetcomp.com.
- The following instructions are for download directly to a computer. If using a waterproof shuttle to conduct field downloads (i.e. to temporarily store data to the shuttle memory), please refer to the manufacture's guidance for instructions.

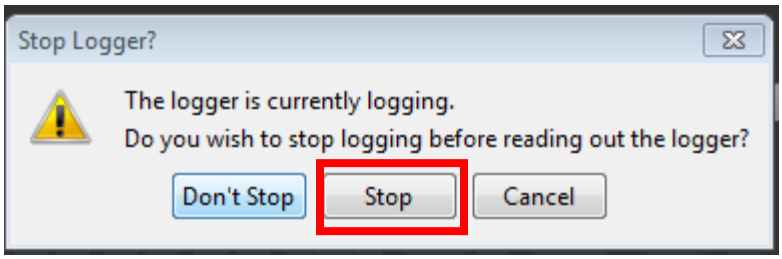
VERY IMPORTANT: If you receive an error message when downloading, DO NOT agree to reset the logger – this will DELETE all data off of the logger. Check that you are using the latest version of HOBOware; update if available and try again. If the error message still persists contact the logger manufacturer (i.e. Onset) to discuss options.

STEP 1: CREATE A FOLDER ON YOUR COMPUTER TO STORE THE DOWNLOAD DATA

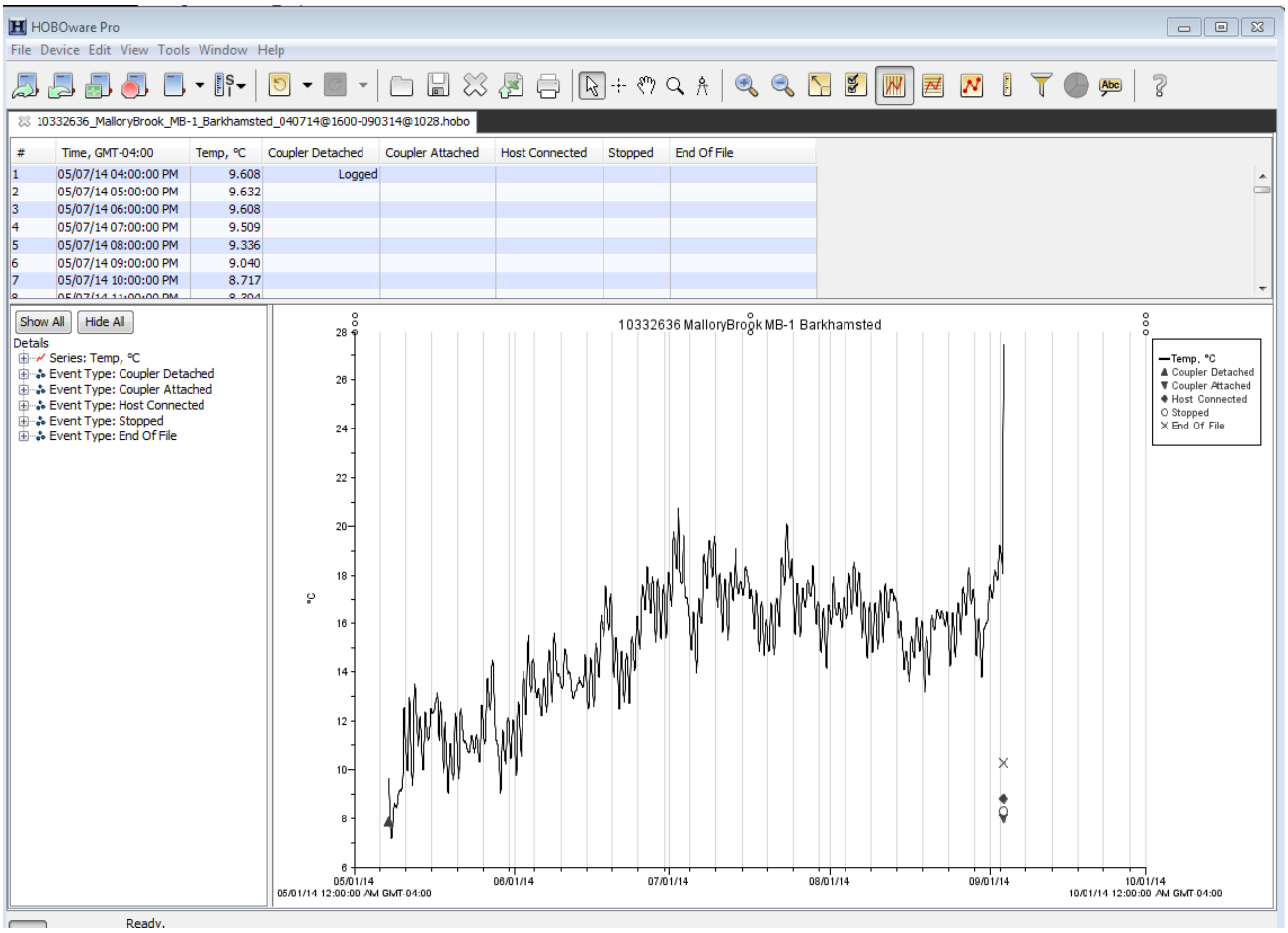
1. Create a folder on your computer to store your logger data. It is recommended that you keep all of you logger downloads, QC files, site photographs, etc. in one master folder on your computer and then have a download folder for each year/season within that master folder. CT DEEP uses the format "[Season][Year] Downloads" (e.g. "Spring 2015 Downloads") to name our download folder.

STEP 2: DOWNLOAD THE LOGGER DATA

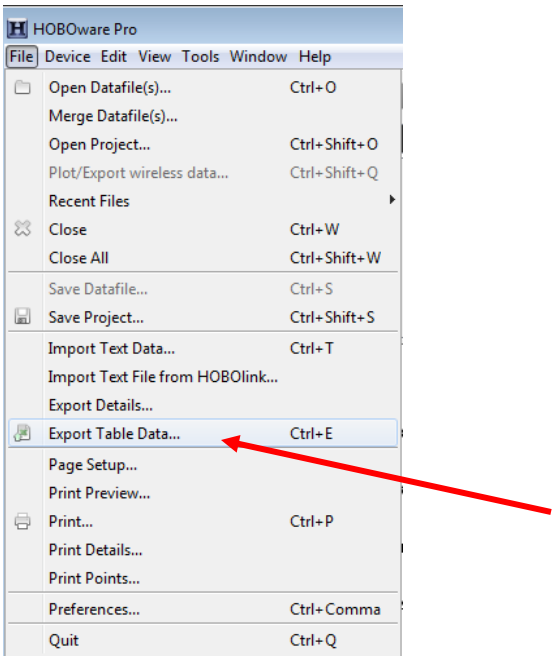
1. Open HOBOware Pro on your computer. Attach the logger to the base station/shuttle and wait for the "1 device connected" message to appear in the lower right.
2. Locate the Monitoring Site Log & Field Data Sheet for the first logger you wish to download. Make sure the logger serial number matches the serial number recorded in the "Retrieval and Final Download" section of the datasheet.
3. Select 'Readout' from the 'Device' menu. The 'Select Device" pop-up window will open – select the HOBO logger from the list and click "OK."
4. When prompted, select 'Stop' to stop the logger from logging.

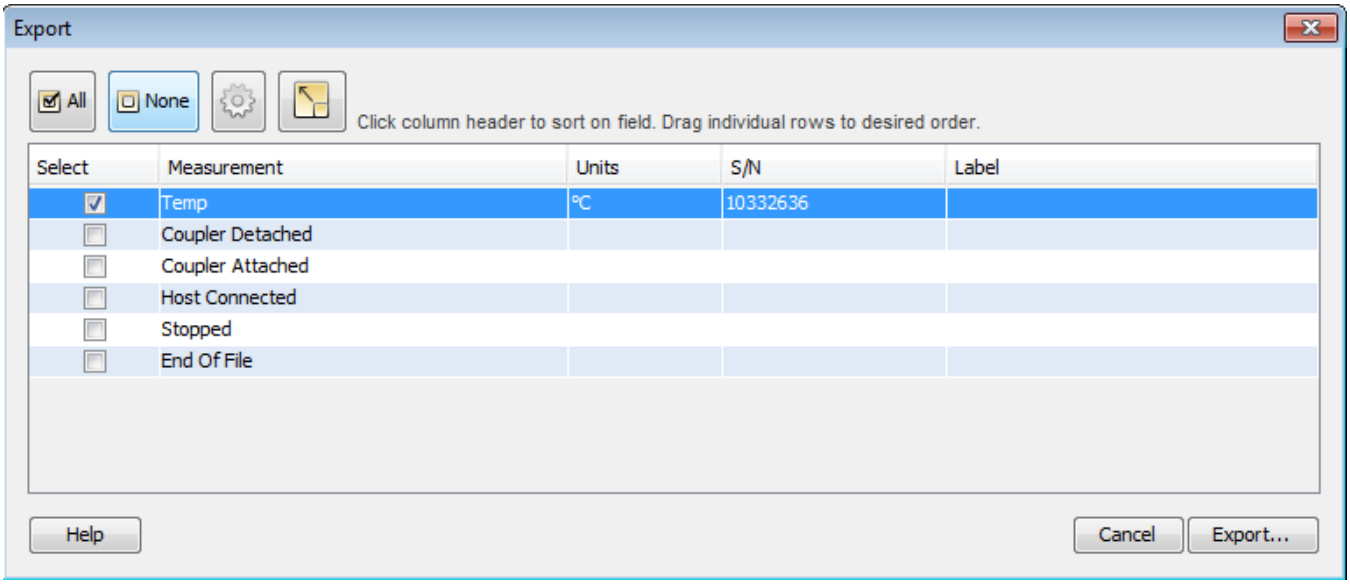


5. A "Save" pop-up window will open. Save the logger data file to the folder you created in Step 1 above. Rename the file using the following naming convention, "[Logger Serial Number]_[Stream Name]_[Site#]_[Town]_[LaunchDate]@[LaunchTime]-[Retrieval Date]@[Retrieval Time]." This naming convention will help you quickly locate information when processing the file in the future. Use military time (e.g. 0 to 24 hour clock) to avoid a.m. vs p.m. time confusion.
    a. For example, for a logger with the serial number 10332636 deployed in the Mallory Brook at site MB-1 in Barkhamsted on May 7, 2014 at 4:00p and retrieved on September 3, 2014 at 10:28a, the file name would be: "10332636_MalloryBrook_MB-1_Barkhamsted_040714@1600-090314@1028."
6. A "Plot Setup" pop-up window will open.
    a. Make sure the "Temp" series is selected and the units set to "C." (If the "Batt" series is checked, uncheck it.)
    b. Click "Plot"; a data table and plot of the logger data will open in the HOBOware window.

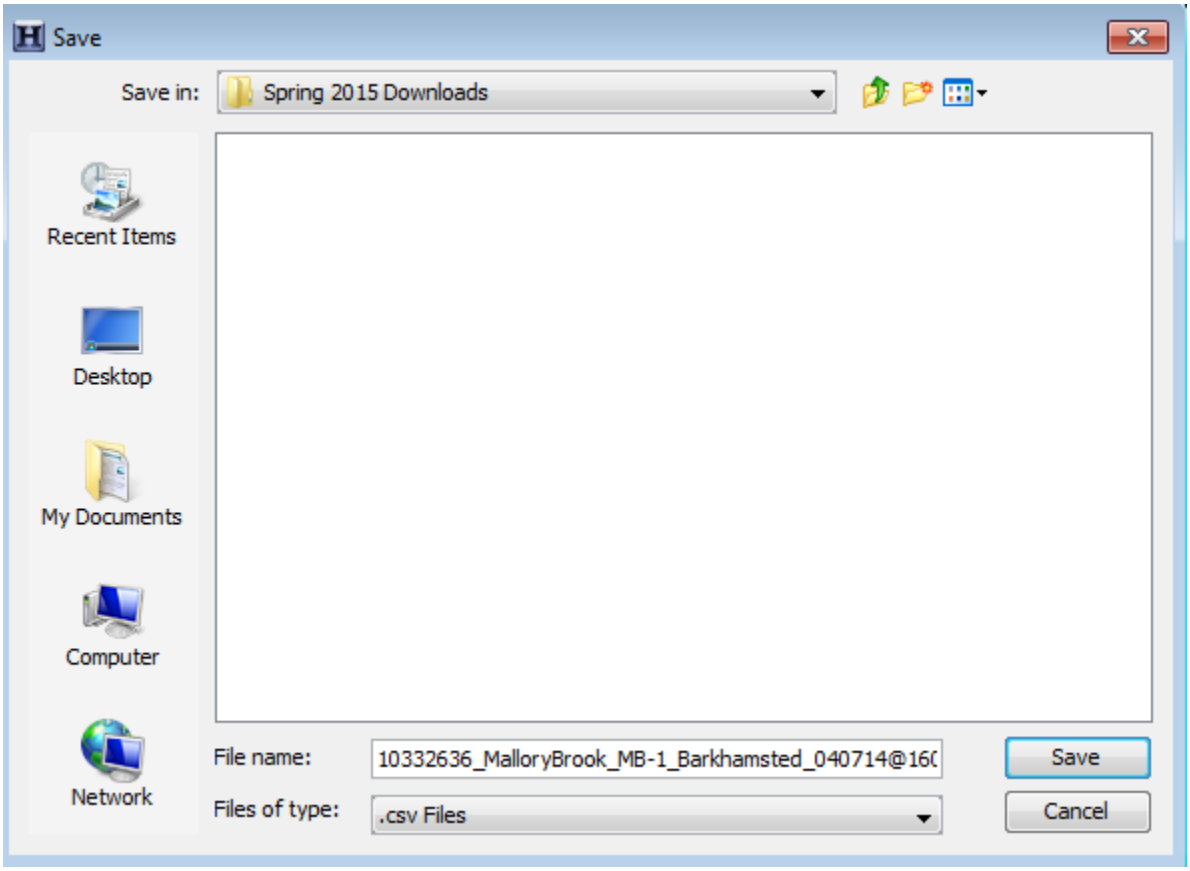


7. Select “Export Table Data” from the “File” menu to export the data as a .csv file. An “Export” pop-up window will appear. Make sure the “Temp” series is checked; uncheck the remaining series and click “Export.”





8. A “Save” pop-up window will open.
    a. Save the file to the downloads folder you created in Step 1 above.
    b. The file name should default to the name you assigned it in Step 2.5 above, but if not again name the file using the convention, “[Logger Serial Number]_[Stream Name]_[Site#]_[Town]_[LaunchDate]@[LaunchTime]-[Retrieval Date]@[Retrieval Time].”
    c. Select “.csv Files” as the file type.
    d. Click “Save”



STEP 3: ORGANIZE THE .CSV FILES INTO AN EXCEL SPREADSHEET FOR SUBMISSION TO CT DEEP

1. Use Windows Explorer to locate the .csv file you created in Step 2 above. Double click on the file to open it in Excel. Save the file with the same name but as an Excel Workbook.

    a. *Note: If using an older version of Excel you may be prompted to interpret the delimitation of the .csv file. Select "Delimited" and click "Next". Check "Comma" off and click "Next" again. Click "Finish." When asked where do you want to put the data select "Existing Worksheet" and type "=$A$1" (no quotation marks) in the box. Click "OK"*

2. The file name should be displayed at the top of your Excel window – you will be able to use this as a convenient "cheat sheet" to clean any 'tails' of erroneous data off the ends of your data set.

    a. Check the Monitoring Site Log & Field Data Sheet to insure the logger was deployed (put into the stream) at a date and time several hours earlier than the launch date and time.

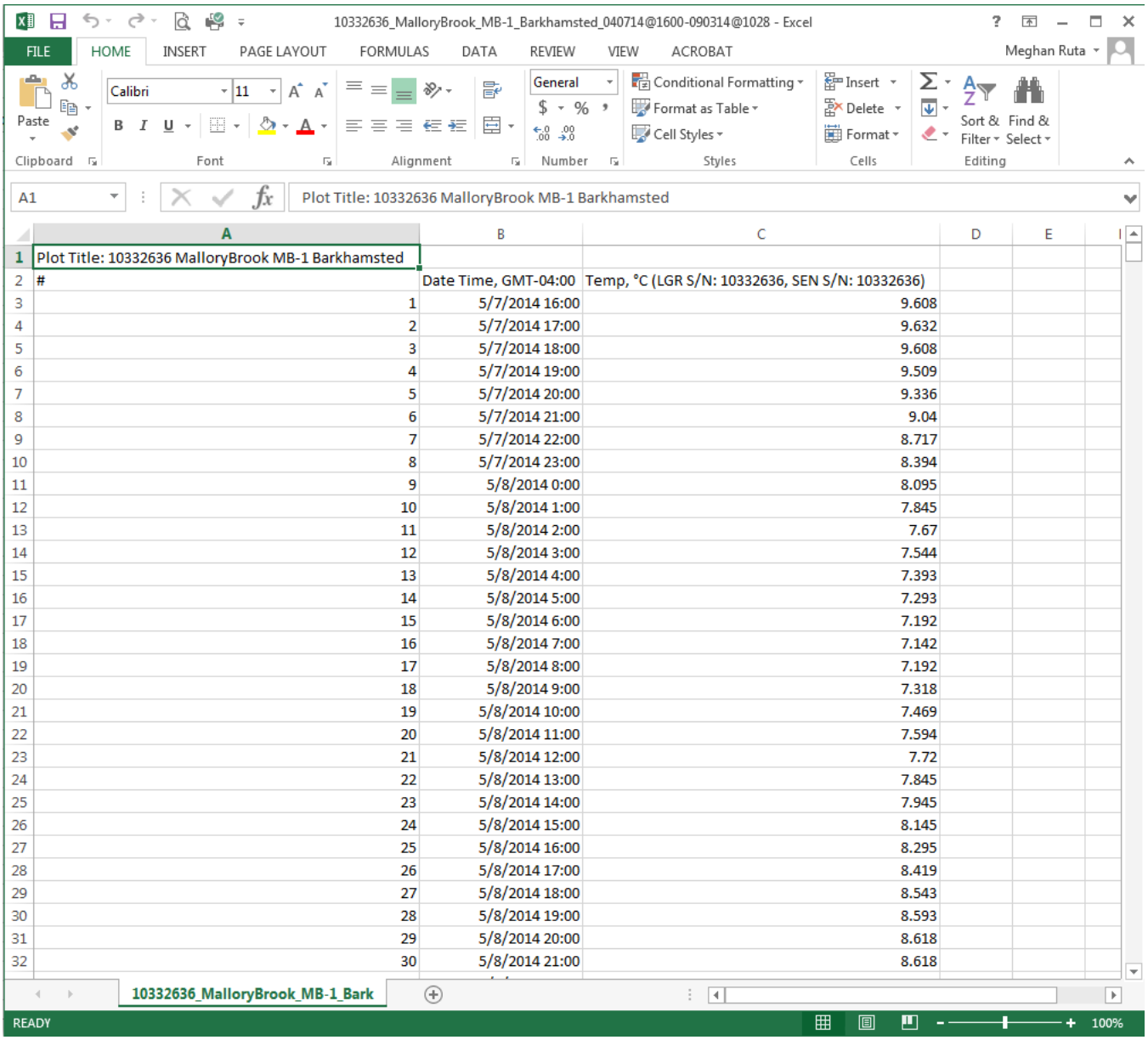
        i. If the logger was launched (i.e. started recording data) before it was deployed, then the first few rows of data will need to be deleted as these were not actual stream temperature data. In this case (i.e. a launch prior to deploy scenario), add 12 hours to the deploy date and time and delete all data prior to this date and time.

    b. If the logger was launched after it was deployed, check to make sure the first data point (e.g. the first row of data) corresponds with the launch date and time noted on the Monitoring Site Log & Field Data Sheet. (If not you will have to determine why there is a discrepancy and take corrective actions accordingly.)

c. Determine the time the logger was removed from the stream. This should be noted as the final date and time in the file name as well as in the 'Retrieval & Final Download Log' portion of the Monitoring Site Log & Field Data Sheet. Round the removal time down to the closest hour and then subtract one additional hour; delete all rows of data after this time on the retrieval date. Save the file.

   i. For example if the logger was removed at 09:13 on 04/05/15, you would round down to 9:00a and then subtract one hour for a final time of 8:00a and delete all data recorded after 8:00a on 4/5/15.)

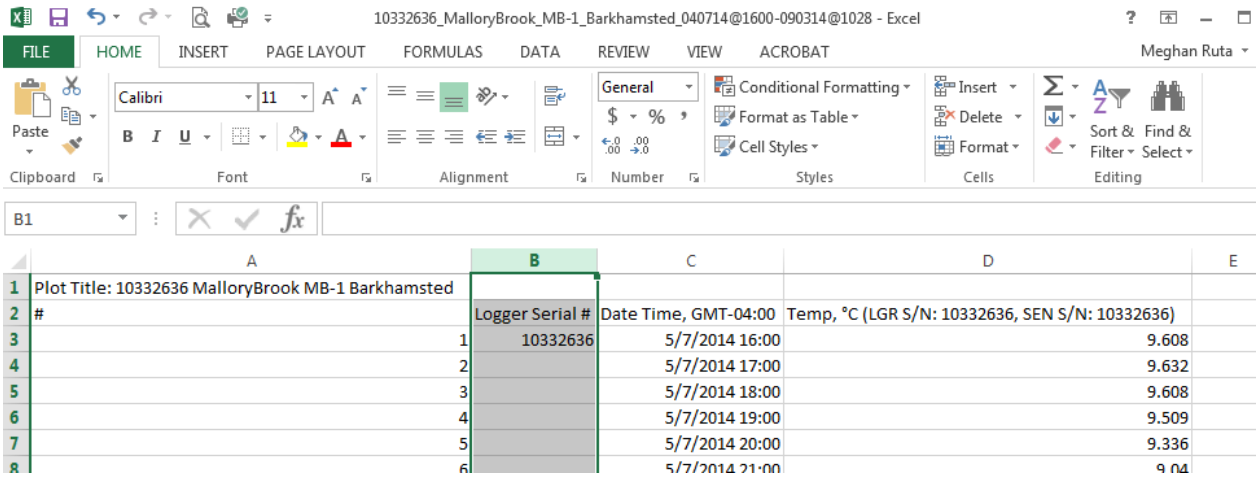
3. Your Excel file should look similar to the following, with the plot title in cell A1 containing the file name. Columns B and C contain the date/time and temperature readings recorded by the logger respectively, and column A indicates the numerical order of the data points recorded.



	A	B	C	D	E
1	Plot Title: 10332636 MalloryBrook MB-1 Barkhamsted				
2	#	Date Time, GMT-04:00	Temp, °C (LGR S/N: 10332636, SEN S/N: 10332636)		
3	1	5/7/2014 16:00	9.608		
4	2	5/7/2014 17:00	9.632		
5	3	5/7/2014 18:00	9.608		
6	4	5/7/2014 19:00	9.509		
7	5	5/7/2014 20:00	9.336		
8	6	5/7/2014 21:00	9.04		
9	7	5/7/2014 22:00	8.717		
10	8	5/7/2014 23:00	8.394		
11	9	5/8/2014 0:00	8.095		
12	10	5/8/2014 1:00	7.845		
13	11	5/8/2014 2:00	7.67		
14	12	5/8/2014 3:00	7.544		
15	13	5/8/2014 4:00	7.393		
16	14	5/8/2014 5:00	7.293		
17	15	5/8/2014 6:00	7.192		
18	16	5/8/2014 7:00	7.142		
19	17	5/8/2014 8:00	7.192		
20	18	5/8/2014 9:00	7.318		
21	19	5/8/2014 10:00	7.469		
22	20	5/8/2014 11:00	7.594		
23	21	5/8/2014 12:00	7.72		
24	22	5/8/2014 13:00	7.845		
25	23	5/8/2014 14:00	7.945		
26	24	5/8/2014 15:00	8.145		
27	25	5/8/2014 16:00	8.295		
28	26	5/8/2014 17:00	8.419		
29	27	5/8/2014 18:00	8.543		
30	28	5/8/2014 19:00	8.593		
31	29	5/8/2014 20:00	8.618		
32	30	5/8/2014 21:00	8.618		

4. Insert a column between column A and column B. In the new cell B2 type "Logger Serial #". In cell B3 type the serial number of the logger that recorded the data contained in the spreadsheet (located in the plot

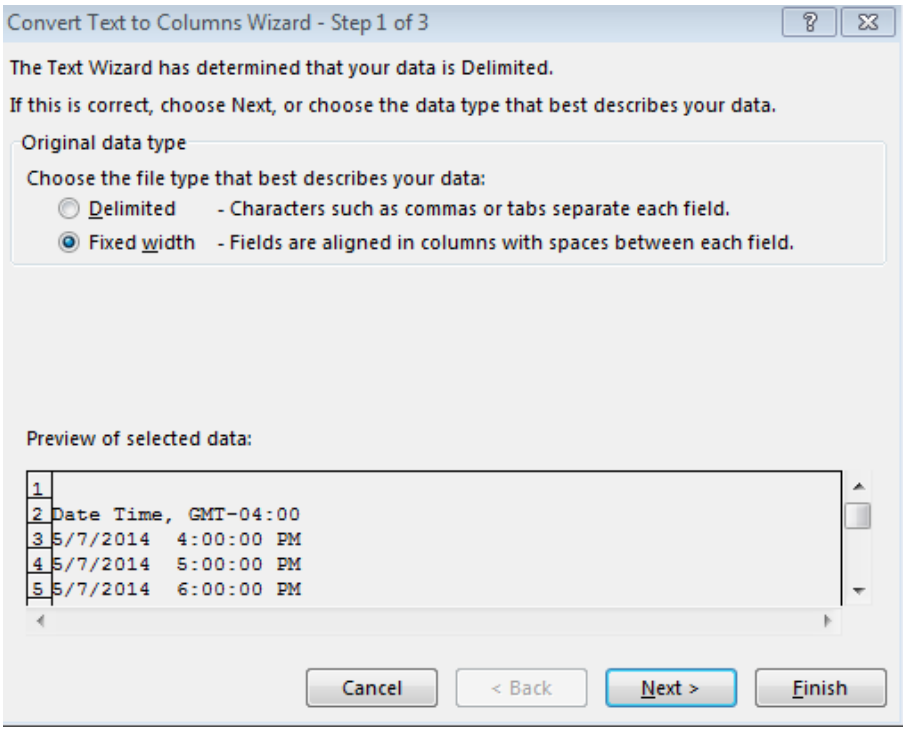
title in Cell A1, at the top of the Excel window in the file name, and in the retrieval section of the Monitoring Site Log & Field Data Sheet.) See the example below:



5. Separate the date and time information from column C into two new columns.

   a. Insert two columns between column C and Column D. (Left-click where it says "D" then, with column D highlighted, right-click; select "Insert" from the menu that appears. Repeat to insert a second column.)

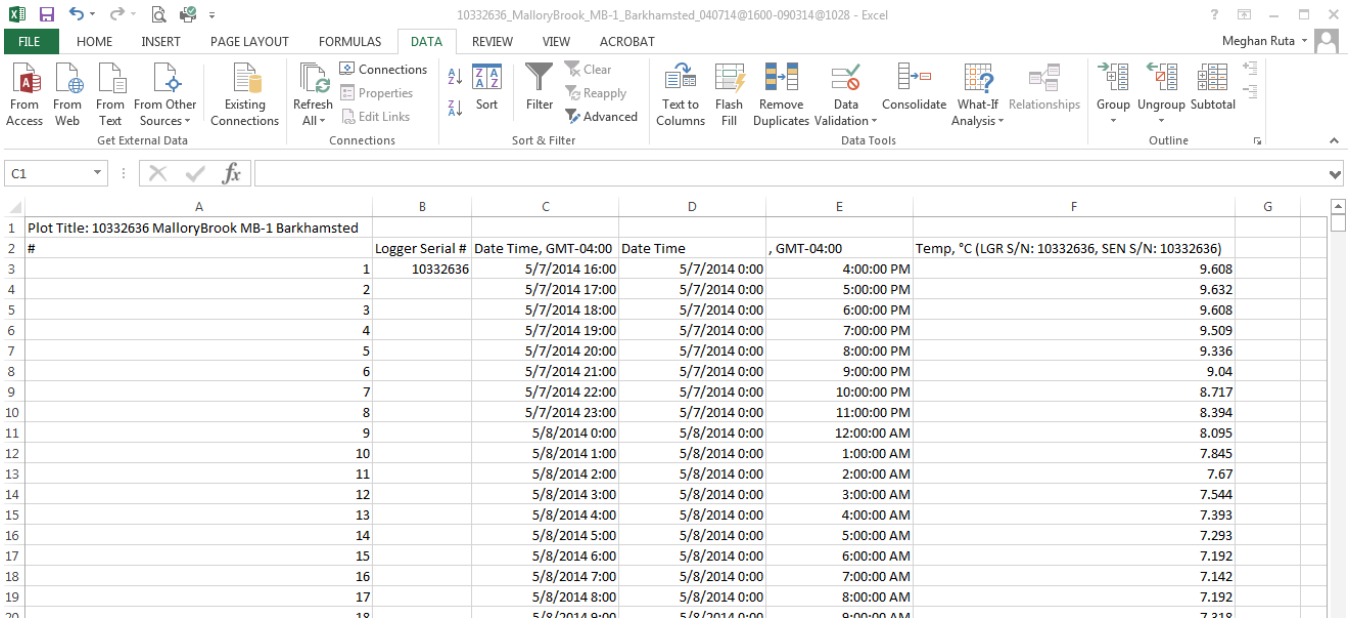
   b. Highlight column C. From the top menu select "Data" and then click on "Text to Columns". A "Convert Text to Columns Wizard" pop-up window will open. Select "Fixed width" then click "Next."



   c. The wizard will display a new screen (Step 2) with a data preview. Use the scroll bar at the right to scroll down through the data; check to insure that the line is correctly

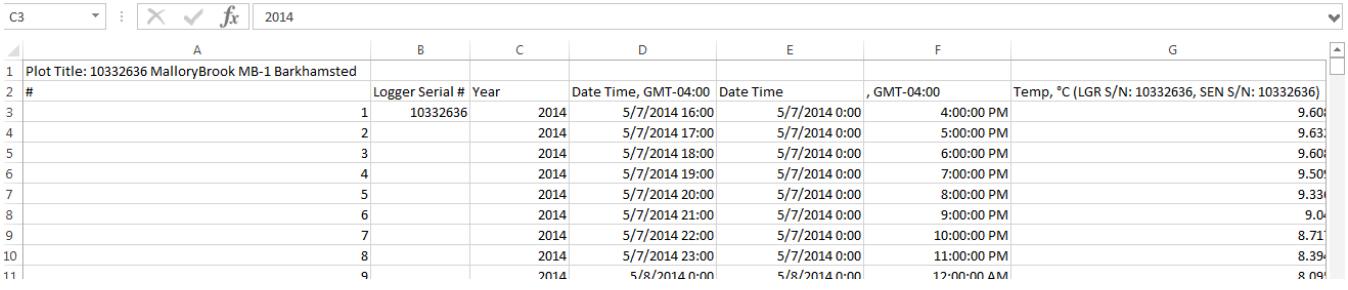
positioned between the date and time columns. Move the line as needed to insuer the data wil lbe correctly split between the two new columns. Click "Next" when you are done.

d. The wizard will display a new screen (Step 3) to allow you to format the data in the new columns and select the destination for the data. Click on the box with the red arrow to the far right of where it says "Destination". (The wizard will temporarily reduce in size to allow you to indicate wher ein the spreadsheet you want the new data to go.) Highlight columns D and E (the blank columns you created) and click Enter. Click "Finish." Your spreadsheet should now look similar to this:



	A	B	C	D	E	F	G
1	Plot Title: 10332636 MalloryBrook MB-1 Barkhamsted						
2	#	Logger Serial #	Date Time, GMT-04:00	Date Time	, GMT-04:00	Temp, °C (LGR S/N: 10332636, SEN S/N: 10332636)	
3	1	10332636	5/7/2014 16:00	5/7/2014 0:00	4:00:00 PM	9.608	
4	2		5/7/2014 17:00	5/7/2014 0:00	5:00:00 PM	9.632	
5	3		5/7/2014 18:00	5/7/2014 0:00	6:00:00 PM	9.608	
6	4		5/7/2014 19:00	5/7/2014 0:00	7:00:00 PM	9.509	
7	5		5/7/2014 20:00	5/7/2014 0:00	8:00:00 PM	9.336	
8	6		5/7/2014 21:00	5/7/2014 0:00	9:00:00 PM	9.04	
9	7		5/7/2014 22:00	5/7/2014 0:00	10:00:00 PM	8.717	
10	8		5/7/2014 23:00	5/7/2014 0:00	11:00:00 PM	8.394	
11	9		5/8/2014 0:00	5/8/2014 0:00	12:00:00 AM	8.095	
12	10		5/8/2014 1:00	5/8/2014 0:00	1:00:00 AM	7.845	
13	11		5/8/2014 2:00	5/8/2014 0:00	2:00:00 AM	7.67	
14	12		5/8/2014 3:00	5/8/2014 0:00	3:00:00 AM	7.544	
15	13		5/8/2014 4:00	5/8/2014 0:00	4:00:00 AM	7.393	
16	14		5/8/2014 5:00	5/8/2014 0:00	5:00:00 AM	7.293	
17	15		5/8/2014 6:00	5/8/2014 0:00	6:00:00 AM	7.192	
18	16		5/8/2014 7:00	5/8/2014 0:00	7:00:00 AM	7.142	
19	17		5/8/2014 8:00	5/8/2014 0:00	8:00:00 AM	7.192	

6. Add a new column between columns B (logger serial #) and column C (original date/time column). Type "Year" in cell C2. Using the original date/time column information as a guide enter the year that corresponds with each row of data. (You can enter the year of the first row and the copy and paste it down into subsequent rows.) If your data contains 12 month data, make sure to change the year when you reach January 1 of the next year. Your data should look similar to the following:



	A	B	C	D	E	F	G
1	Plot Title: 10332636 MalloryBrook MB-1 Barkhamsted						
2	#	Logger Serial #	Year	Date Time, GMT-04:00	Date Time	, GMT-04:00	Temp, °C (LGR S/N: 10332636, SEN S/N: 10332636)
3	1	10332636	2014	5/7/2014 16:00	5/7/2014 0:00	4:00:00 PM	9.60
4	2		2014	5/7/2014 17:00	5/7/2014 0:00	5:00:00 PM	9.63
5	3		2014	5/7/2014 18:00	5/7/2014 0:00	6:00:00 PM	9.60
6	4		2014	5/7/2014 19:00	5/7/2014 0:00	7:00:00 PM	9.50
7	5		2014	5/7/2014 20:00	5/7/2014 0:00	8:00:00 PM	9.33
8	6		2014	5/7/2014 21:00	5/7/2014 0:00	9:00:00 PM	9.0
9	7		2014	5/7/2014 22:00	5/7/2014 0:00	10:00:00 PM	8.71
10	8		2014	5/7/2014 23:00	5/7/2014 0:00	11:00:00 PM	8.39

7. Delete the first column (the one that contains the "Plot Title"). Then delete the top row.

8. Change your column headers to read: "Logger Serial #", "Year", "Date Time", "Date", "Time", and "Temp C".

9. Click on the cell that contains the logger serial number to highlight it. Double-click on the green box that appears in the lower right corner to copy the serial number to the rows beneath it.

10. Add the title "Organization" to column G (cell G1) and beneath it type the name of the organization responsible for the data. Add the title "Stream" to column H (cell H1) and beneath it type the name of the stream monitored. Click on the cell that contains the organization name and stream name to highlight them. Double-click on the green box that appears in the lower right corner to copy the information to the rows beneath. Your data should look similar to the following:

L10

	A	B	C	D	E	F	G	H	I	J
1	Logger Serial #	Year	Date Time	Date	Time	Temp C	Organization	Stream		
2	10332636	2014	5/7/2014 16:00	5/7/2014 0:00	4:00:00 PM	9.608	Mallory Brook Watershed Association	Mallory Brook		
3	10332636	2014	5/7/2014 17:00	5/7/2014 0:00	5:00:00 PM	9.632	Mallory Brook Watershed Association	Mallory Brook		
4	10332636	2014	5/7/2014 18:00	5/7/2014 0:00	6:00:00 PM	9.608	Mallory Brook Watershed Association	Mallory Brook		
5	10332636	2014	5/7/2014 19:00	5/7/2014 0:00	7:00:00 PM	9.509	Mallory Brook Watershed Association	Mallory Brook		
6	10332636	2014	5/7/2014 20:00	5/7/2014 0:00	8:00:00 PM	9.336	Mallory Brook Watershed Association	Mallory Brook		
7	10332636	2014	5/7/2014 21:00	5/7/2014 0:00	9:00:00 PM	9.04	Mallory Brook Watershed Association	Mallory Brook		
8	10332636	2014	5/7/2014 22:00	5/7/2014 0:00	10:00:00 PM	8.717	Mallory Brook Watershed Association	Mallory Brook		
9	10332636	2014	5/7/2014 23:00	5/7/2014 0:00	11:00:00 PM	8.394	Mallory Brook Watershed Association	Mallory Brook		
10	10332636	2014	5/8/2014 0:00	5/8/2014 0:00	12:00:00 AM	8.095	Mallory Brook Watershed Association	Mallory Brook		
11	10332636	2014	5/8/2014 1:00	5/8/2014 0:00	1:00:00 AM	7.845	Mallory Brook Watershed Association	Mallory Brook		
12	10332636	2014	5/8/2014 2:00	5/8/2014 0:00	2:00:00 AM	7.67	Mallory Brook Watershed Association	Mallory Brook		
13	10332636	2014	5/8/2014 3:00	5/8/2014 0:00	3:00:00 AM	7.544	Mallory Brook Watershed Association	Mallory Brook		
14	10332636	2014	5/8/2014 4:00	5/8/2014 0:00	4:00:00 AM	7.393	Mallory Brook Watershed Association	Mallory Brook		
15	10332636	2014	5/8/2014 5:00	5/8/2014 0:00	5:00:00 AM	7.293	Mallory Brook Watershed Association	Mallory Brook		
16	10332636	2014	5/8/2014 6:00	5/8/2014 0:00	6:00:00 AM	7.192	Mallory Brook Watershed Association	Mallory Brook		
17	10332636	2014	5/8/2014 7:00	5/8/2014 0:00	7:00:00 AM	7.142	Mallory Brook Watershed Association	Mallory Brook		
18	10332636	2014	5/8/2014 8:00	5/8/2014 0:00	8:00:00 AM	7.192	Mallory Brook Watershed Association	Mallory Brook		
19	10332636	2014	5/8/2014 9:00	5/8/2014 0:00	9:00:00 AM	7.318	Mallory Brook Watershed Association	Mallory Brook		
20	10332636	2014	5/8/2014 10:00	5/8/2014 0:00	10:00:00 AM	7.469	Mallory Brook Watershed Association	Mallory Brook		
21	10332636	2014	5/8/2014 11:00	5/8/2014 0:00	11:00:00 AM	7.594	Mallory Brook Watershed Association	Mallory Brook		
22	10332636	2014	5/8/2014 12:00	5/8/2014 0:00	12:00:00 PM	7.72	Mallory Brook Watershed Association	Mallory Brook		
23	10332636	2014	5/8/2014 13:00	5/8/2014 0:00	1:00:00 PM	7.845	Mallory Brook Watershed Association	Mallory Brook		
24	10332636	2014	5/8/2014 14:00	5/8/2014 0:00	2:00:00 PM	7.945	Mallory Brook Watershed Association	Mallory Brook		

11. Add the title "Site" to column I and beneath it type the site number assigned to that monitoring location by the volunteer group coordinator. (This should be recorded at the top of the Monitoring Site Log & Field Data Sheet and included in the file name at the top of your Excel window.) Left-click on the cell, then right-click and select "copy." Click on cell I-3, and while holding down the left mouse button, scroll down to highlight, for all remaining rows with data, the cells in column I. When done right-click and select paste. All rows of data should now have the same site number assigned to them.

12. Highlight column D ("Date") and then from the menu at the top of the window select Home > Format > Format Cells. Click on the "Number" tab and select "Date" from the Category list. Select the top option from the type list to select date in the *M/DD/YYYY format and click "OK."

13. Highlight column E ("Time") and then from the menu at the top of the window select Home > Format > Format Cells. Click on the "Number" tab and select "Time" from the Category list. Select the second option from the type list to select time in the HH:MM military format and click "OK."

14. Highlight column F ("Temp C") and then from the menu at the top of the window select Home > Format > Format Cells. Click on the "Number" tab and select "Number" from the Category list. In the decimal places field type "3" and click "OK".

15. Your data should look similar to the following:

	A	B	C	D	E	F	G	H	I	J
1	Logger Serial #	Year	Date Time	Date	Time	Temp C	Organization	Stream	Site	
2	10332636	2014	5/7/2014 16:00	5/7/2014	16:00	9.608	Mallory Brook Watershed Association	Mallory Brook	MB-1	
3	10332636	2014	5/7/2014 17:00	5/7/2014	17:00	9.632	Mallory Brook Watershed Association	Mallory Brook	MB-1	
4	10332636	2014	5/7/2014 18:00	5/7/2014	18:00	9.608	Mallory Brook Watershed Association	Mallory Brook	MB-1	
5	10332636	2014	5/7/2014 19:00	5/7/2014	19:00	9.509	Mallory Brook Watershed Association	Mallory Brook	MB-1	
6	10332636	2014	5/7/2014 20:00	5/7/2014	20:00	9.336	Mallory Brook Watershed Association	Mallory Brook	MB-1	
7	10332636	2014	5/7/2014 21:00	5/7/2014	21:00	9.040	Mallory Brook Watershed Association	Mallory Brook	MB-1	
8	10332636	2014	5/7/2014 22:00	5/7/2014	22:00	8.717	Mallory Brook Watershed Association	Mallory Brook	MB-1	
9	10332636	2014	5/7/2014 23:00	5/7/2014	23:00	8.394	Mallory Brook Watershed Association	Mallory Brook	MB-1	
10	10332636	2014	5/8/2014 0:00	5/8/2014	0:00	8.095	Mallory Brook Watershed Association	Mallory Brook	MB-1	
11	10332636	2014	5/8/2014 1:00	5/8/2014	1:00	7.845	Mallory Brook Watershed Association	Mallory Brook	MB-1	
12	10332636	2014	5/8/2014 2:00	5/8/2014	2:00	7.670	Mallory Brook Watershed Association	Mallory Brook	MB-1	
13	10332636	2014	5/8/2014 3:00	5/8/2014	3:00	7.544	Mallory Brook Watershed Association	Mallory Brook	MB-1	
14	10332636	2014	5/8/2014 4:00	5/8/2014	4:00	7.393	Mallory Brook Watershed Association	Mallory Brook	MB-1	
15	10332636	2014	5/8/2014 5:00	5/8/2014	5:00	7.293	Mallory Brook Watershed Association	Mallory Brook	MB-1	
16	10332636	2014	5/8/2014 6:00	5/8/2014	6:00	7.192	Mallory Brook Watershed Association	Mallory Brook	MB-1	
17	10332636	2014	5/8/2014 7:00	5/8/2014	7:00	7.142	Mallory Brook Watershed Association	Mallory Brook	MB-1	
18	10332636	2014	5/8/2014 8:00	5/8/2014	8:00	7.192	Mallory Brook Watershed Association	Mallory Brook	MB-1	
19	10332636	2014	5/8/2014 9:00	5/8/2014	9:00	7.318	Mallory Brook Watershed Association	Mallory Brook	MB-1	
20	10332636	2014	5/8/2014 10:00	5/8/2014	10:00	7.469	Mallory Brook Watershed Association	Mallory Brook	MB-1	
21	10332636	2014	5/8/2014 11:00	5/8/2014	11:00	7.594	Mallory Brook Watershed Association	Mallory Brook	MB-1	

16. Save and close your file.

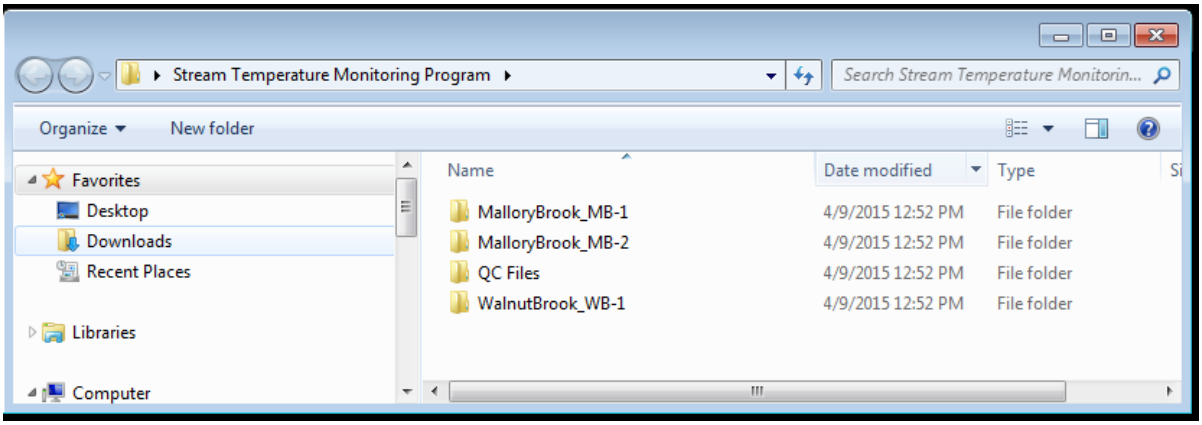
Repeat the above process for any remaining loggers that need to be downloaded.

DATA SUBMISSION TO DEEP

For CT DEEP WPLR to use volunteer data in our projects, the following files must be submitted to DEEP:

- For each logger/site monitored:
    - Scanned copy of the completed Monitoring Site Log & Field Data Sheet
    - Site photographs – labelled with photograph date, stream name, and site number
    - Original logger data download (.hobo file)
    - Cleaned logger data (Excel file)
- The program QC log summarizing individual QC results
- Logger QC files (.hobo and .Excel files)

Due to the size and volume of files that must be submitted, do not email files to DEEP. It is recommended that coordinators organize their files onto a USB stick or CD for submission. Please organize files so that all files for a particular site (i.e. scanned data sheet, photographs and logger data) are contained in individual folders labelled with the site number. QC files and scanned logs can be organized in a separate "QC File" folder. See below as an example.



Mail or hand-deliver files to:

Meghan Lally
CT DEEP Bureau of Water Protection & Land Reuse
Planning & Standards Division
Monitoring & Assessment Program
79 Elm Street
Hartford, CT 06106-5127

APPENDIX A:
QC CHECK LOG

APPENDIX B:
MONITORING SITE LOG & FIELD DATA SHEET

APPENDIX C:
SITE PHOTOGRAPH INSTRUCTIONS

APPENDIX D:
USING EXCEL TO CALCULATE CT SUMMER METRICS