NEON Standard Operating Procedure: EXO2 Multisonde Data Management Procedure

PREPARED BY	ORGANIZATION	DATE
Bryce Nance	AQU	12/05/2019
Madeline Cavileer	ENG	12/05/2019

APPROVALS	ORGANIZATION	APPROVAL DATE
Keli Goodman	AQU	12/09/2019
Frank Mocilac	ENG	12/12/2019

RELEASED BY	ORGANIZATION	RELEASE DATE
Anne Balsley	CM	12/12/2019

See configuration management system for approval history.

The National Ecological Observatory Network is a project solely funded by the National Science Foundation and managed under cooperative agreement by Battelle. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

Change Record

REVISION	DATE	ECO #	DESCRIPTION OF CHANGE
A	12/12/2019	ECO-06333	Initial release.

TABLE OF CONTENTS

1 DESCRIPTION 1

1.1 Purpose 1

1.2 Scope 1

2 RELATED DOCUMENTS AND ACRONYMS 2

2.1 Applicable Documents 2

2.2 Reference Documents 2

2.3 External References 2

2.4 Acronyms 2

3 OVERVIEW 3

3.1 Components 3

3.2 Subsystem Location and Access 3

4 FIELD DATA MANAGAMENT PROCEDURE 3

4.1 Equipment 3

4.2 Connect to a Multisonde: Communication Settings 4

4.3 Enable Logging Procedure 5

4.4 Disable Logging Procedure 9

4.5 Data Download Procedure 9

4.6 Deleting Data File Procedure 11

4.7 Data Upload Procedure 12

LIST OF TABLES AND FIGURES

Table 1. Equipment Table 3

Figure 1. USB to Sonde Connection Method 4
Figure 2. Bluetooth to Sonde Connection Method 4
Figure 3. Navigate to Deployment Settings 5
Figure 4. Select Open a Template 6
Figure 5. Choose a Deployment Template and Click Load 6
Figure 6. Set up the Template for Logging 7
Figure 7. Loading Deployment Settings 7

Figure 8. Select a Custom Time ~10 Minutes from the Current Time to Start on an Even 5 Minute Interval 8
Figure 9. Read Current Sonde Settings to Verify Logging is Enabled 8
Figure 10. Click “Stop Deployment” to Stop the Multisonde from Collecting Data 9
Figure 11. Confirm and Acknowledge Deployment is being Stopped 9
Figure 12. Select the Blue File Folder to Download the Data 10
Figure 13. Select "View/Export" 10
Figure 14. Select the Smaller Blue Folder Icon to Select the Log File to Download 10
Figure 15. Select File to Download 11
Figure 16. Export Data to MS Excel 11
Figure 17. N:\Science\Sensor Swap\Sonde 12
Figure 18. Multisonde Serial Number Location 12

1 DESCRIPTION

1.1 Purpose

The purpose of this document is to provide standard instructional guidance on how to enable and disable logging, in addition to downloading, storing and transferring data for the EXO2 Multiparameter Sonde (herein referred to as the Multisonde or Sonde).

1.2 Scope

The operating procedures herein apply to managing data for the Multisonde sensors at stream Aquatic Instrument Sites (AIS) in the event of a power outage or under the direction of AIS Science. Data management procedures include data collection (logging), transmission and storage (downloading the data from log files and transferring them to the network drive) using KorEXO Software Version 1.0.12. This procedure does not apply to lake and river sites (i.e., Multisondes that collect measurements from a buoy).

2 RELATED DOCUMENTS AND ACRONYMS

2.1 Applicable Documents

The following applicable documents (AD) contain mandatory requirements and/or supplementary information that are directly applicable to the topic and/or procedures herein. Visit the NEON Document Warehouse for electronic copies of these documents.

AD [01]	NEON.DOC.001569	NEON Preventive Maintenance Procedure: AIS Surface Water Quality Multisonde

2.2 Reference Documents

The reference documents (RD) listed below may provide complimentary information to support this procedure. Visit the NEON Document Warehouse for electronic copies of these documents.

RD [01]	NEON.DOC.000008	NEON Acronym List
RD [02]	NEON.DOC.000243	NEON Glossary of Terms
RD [03]	NEON.DOC.001166	NEON Sensor Command, Control and Configuration (C3) Document: Multisonde, Stream
RD [04]	NEON.DOC.004419	Stream or Lake Water Level Formal Verification Procedure
RD [05]	NEON.DOC.003880	NEON Preventive Maintenance Procedure: AIS Stream Infrastructure
RD [06]	NEON.DOC.004886	NEON Preventive Maintenance Procedure: Aquatic Portal & AIS Device Posts
RD [07]	NEON.DOC.005048	NEON Installation Procedure: HB066000XX- Subsystem, Sensor Infrastructure, Stream, [Sand, Bedrock, Cobble]

2.3 External References

The external references (ER) listed below contains supplementary information relevant to this procedure. These documents are external to the NEON program and Battelle.

ER [01]	YSI Incorporated, EXO user manual, www.EXOwater.com https://www.ysi.com/File%20Library/Documents/Manuals/EXO-User-Manual-Web.pdf

2.4 Acronyms

A/R	As Required
P/N	Part Number
AIS	Aquatic Instrument Site
CVAL or CVL	Calibration, Validation and Audit Laboratory
fDOM	Fluorescent Dissolved Organic Matter
S1	Upstream
S2	Downstream
SOA	Signal Output Adapter
UTC	Coordinated Universal Time

3 OVERVIEW

3.1 Components

This document includes components from the following assemblies:

- **HB07530000** Assembly, Multisonde with Sensors, FDOM
- **HB07530010** Assembly, Multisonde with Sensors, No FDOM

3.2 Subsystem Location and Access

Multisondes reside at both core and relocatable AIS sites. Access to AIS sites require Aquatic PPE and may require a boat. At wadeable stream sites, the Multisonde is part of both the upstream (S1) and downstream sensor set (S2), or single station sensor sets.

4 FIELD DATA MANAGAMENT PROCEDURE

IMPORTANT: For stream sites, this procedure requires KorEXO Software Version 1.0.12. Download KorEXO via ***N:\Common\CVL\Field_Calibration\EXO2 Software and Firmware***.

If a Multisonde at a site is logging data in accordance with the procedures herein, download the log files and replace the D-cell batteries every two (2) weeks. If you are unable to reach the Multisonde due to seasonal weather or other site dynamics, download the log files as frequently as possible.

4.1 Equipment

Table 1. Equipment Table

Part Number (P/N)	NEON P/N	Description	Quantity
NEON IT/YSI		Laptop with KorEXO Version 1.0.12 and associated FTDI drivers, as applicable	1
YSI		USB Signal Output Adapter (SOA) Cable (If connecting to the Sonde via USB)	1
GENERIC		Alkaline D-Cell Batteries or NiMH D-cell Batteries with a minimum rating of 10,000 milliamp hours (Multisonde internal batteries)	4
GENERIC		Magnet (If connecting via Bluetooth)	1
YSI		Multisonde Tool (To open battery compartment or wake-up the Multisonde for Bluetooth)	1

PRO TIP: *Recommend downloading the KorEXO/LoggerNet software on a loaner laptop to use in the field to prevent damaging the laptop you use daily for the NEON program. This procedure may require FTDI Drivers if you are using a loaner or new laptop. Download the drivers here http://www.ftdichip.com/FTDrivers.htm or via* ***N:\Common\CVL\Field_Calibration\Drivers\FTDI****. If you have a new laptop or loaner laptop with newly installed KorEXO software, update the drivers, if necessary/applicable, while you have internet connection at the Domain. Plug the adapter into a USB port on your laptop while connected to the internet. Click the window that pops up in the lower right of*

the task bar. This should open a Properties window for the USB device. Click the "Driver" tab, and then select "Update Driver".

4.2 Connect to a Multisonde: Communication Settings

There are two ways to connect to a Multisonde: 1) via a USB connection (Figure 1) and 2) via Bluetooth (Figure 2). Reference AD [01] for more information on both methods.

Figure 1. USB to Sonde Connection Method

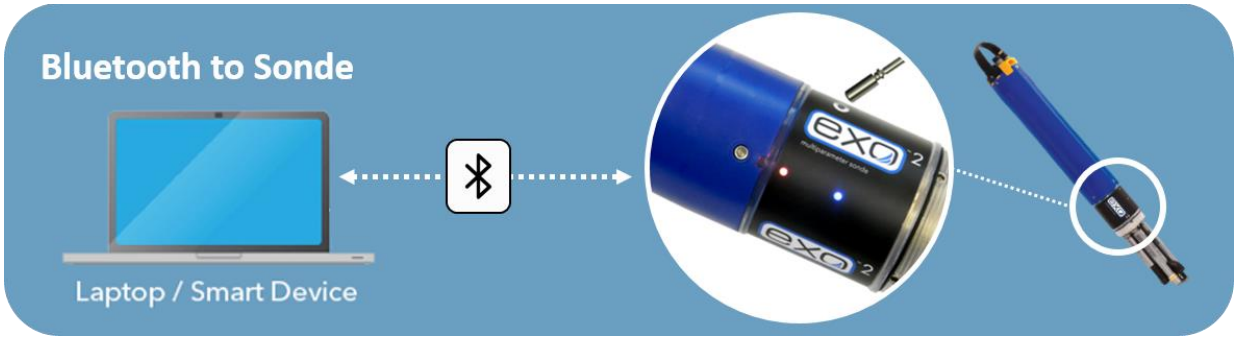

Figure 2. Bluetooth to Sonde Connection Method

Activate Bluetooth with a magnet swipe at the magnetic activation area. Bluetooth is on when the blue LED is lit. When the blue LED is off, the Bluetooth is disabled. When the light is on continuously, the Bluetooth is enabled, but no link has been established. When the blue LED blinks at 2 Hz, the Sonde's Bluetooth is on and linked with your laptop or other compatible device. When the red LED is off, the Sonde is either off or asleep and not logging. When it blinks at 0.1 Hz (once every 10 seconds), the Sonde is asleep and logging is enabled. When the red light blinks at 1 Hz, the Sonde is awake and has no faults. If the red light is lit continuously, the Sonde is awake and has detected faults that require fixing prior to use.

PRO TIP: *Any strong magnet is capable of waking up the Sonde. If you are unable to wake up the sensor using a magnet or Multisonde tool, or do not have a magnet available, pop the battery cover to activate (wakeup) the sensor.*

Note: If the Multisonde internal batteries drops below 5.5 Volts, the Bluetooth connection may not work. Use the USB cable if you think the battery voltage may be low onsite. If the Multisonde is directly connected to a power source, ***HQ*** *recommends using the Bluetooth connection.*

4.3 Enable Logging Procedure

When enabling logging on the Sonde, disconnect the cable from the Grape, if applicable for your site, and replace the (4) internal D-Cell batteries every two weeks. Disable logging when removing the Sonde from the water to prevent the collection of bad data. Reference Section 4.4 for instructions on how to disable logging on the Multisonde.

1. Open the KorEXO software on your laptop and navigate from the Menu bar to the **Deployment** Settings (click on the green arrow icon in Figure 3).

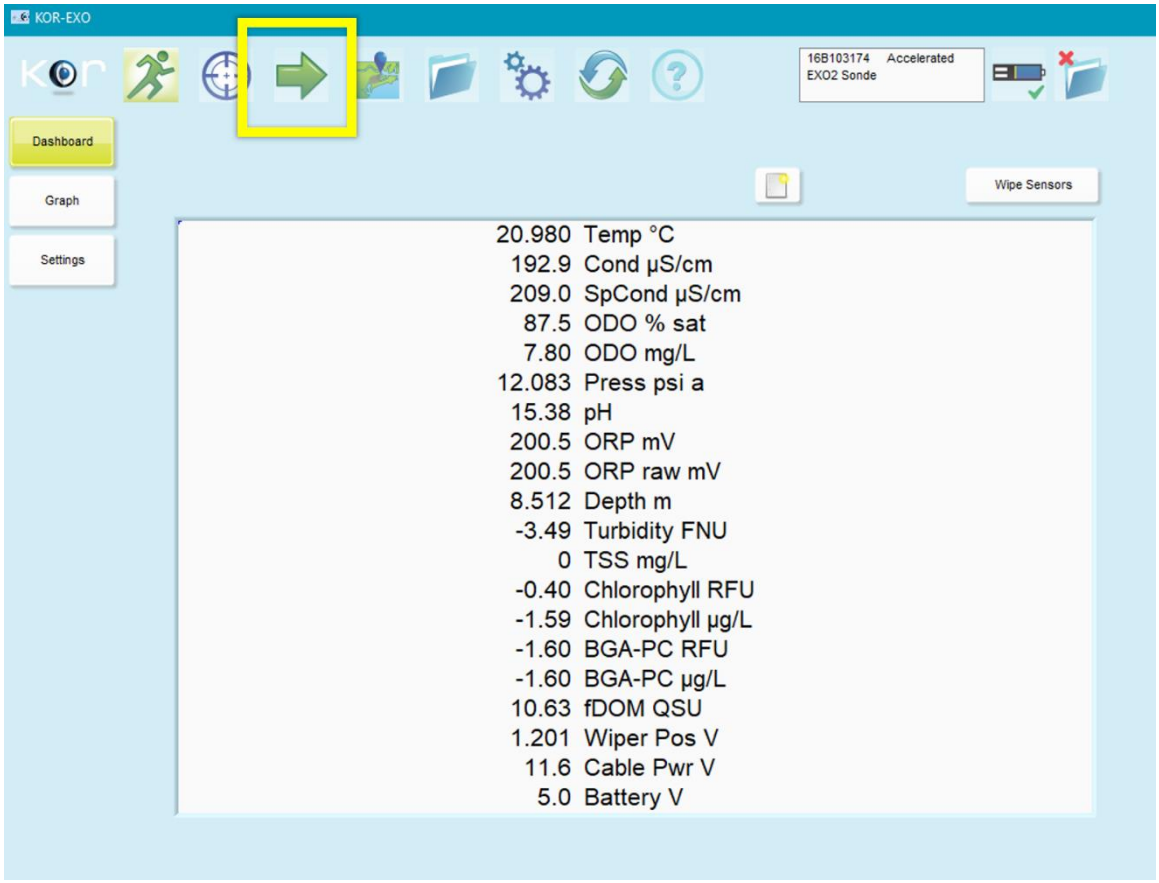

Figure 3. Navigate to Deployment Settings

2. Then select **Open a Template** (Figure 4).

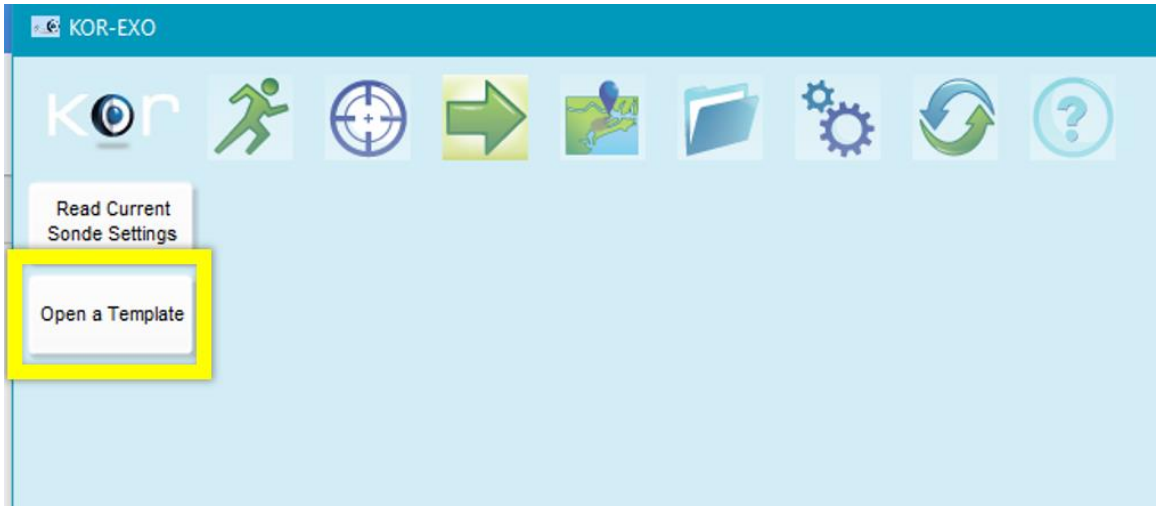

Figure 4. Select Open a Template

3. In the file folder pop-up window, choose a deployment template and click **Load** (Figure 5).

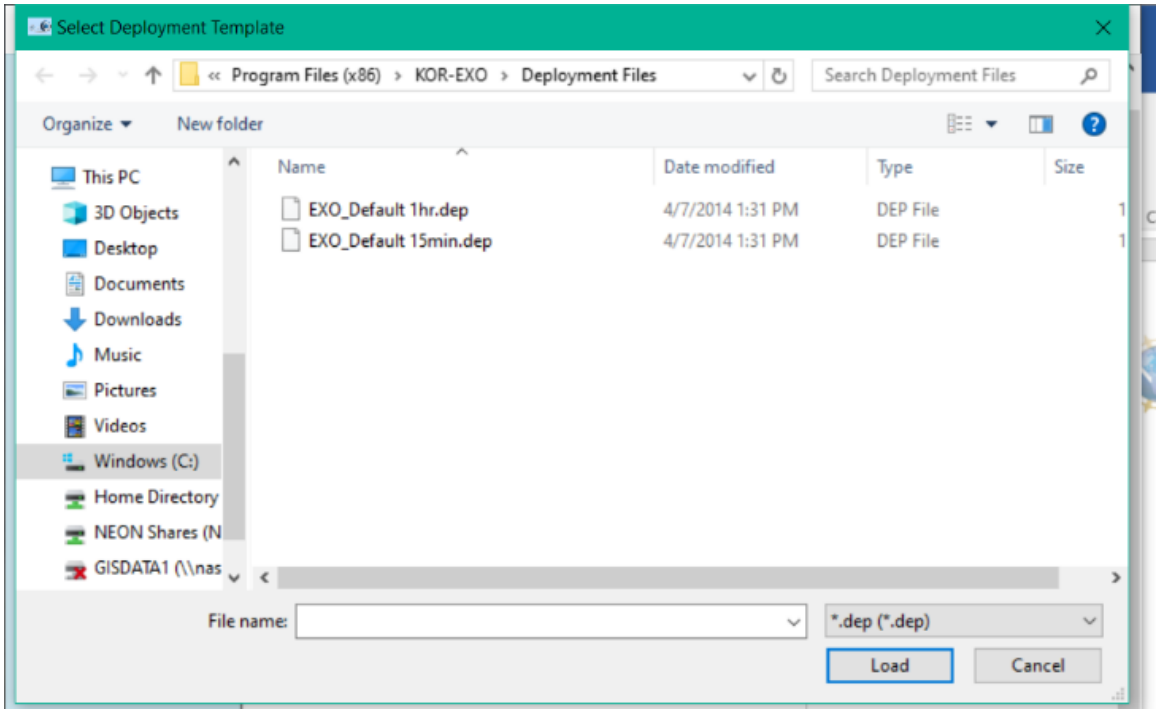

Figure 5. Choose a Deployment Template and Click Load

4. In the Template Edit window, update the **Template Name** to "**DXX_SITE_yyyymmdd_Serial#**" (A in Figure 6) and set the **Logging Interval** to **five (5) minutes** (B in Figure 6). Ensure the **Deployment Time Zone** is **UTC** (Coordinated Universal Time). When complete, click the green arrow at the bottom of the pop-up window to continue (C in Figure 6).

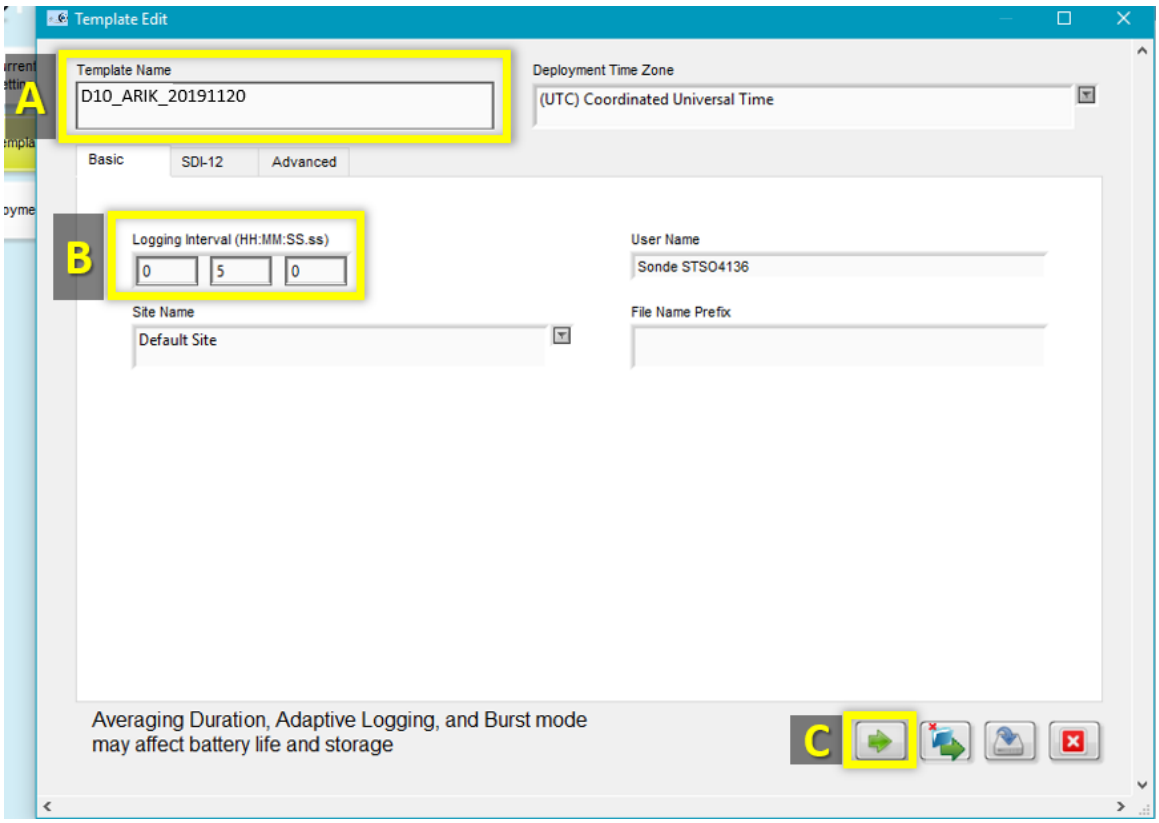

Figure 6. Set up the Template for Logging

5. The Multisonde loads the template and verifies the sensor settings (Figure 7). If you encounter a dialogue box requesting confirmation on the settings and to continue with the deployment, click "**Continue**".

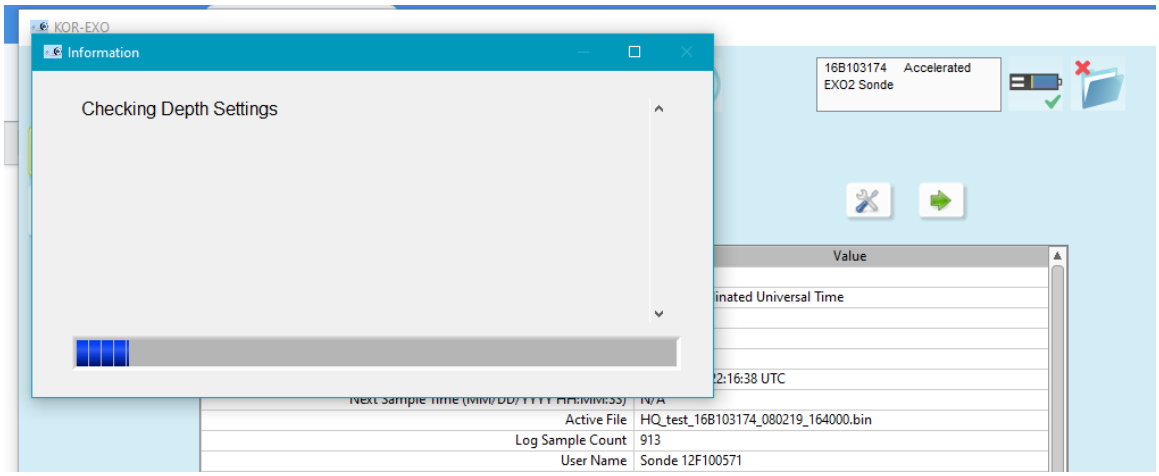

Figure 7. Loading Deployment Settings

6. When the **Select Log Start Time** window appears, select a custom time approximately 10 minutes in the future from the current time (**Now**) to start data collection on an even five (5) minute interval and click "**Apply**" (Figure 8).

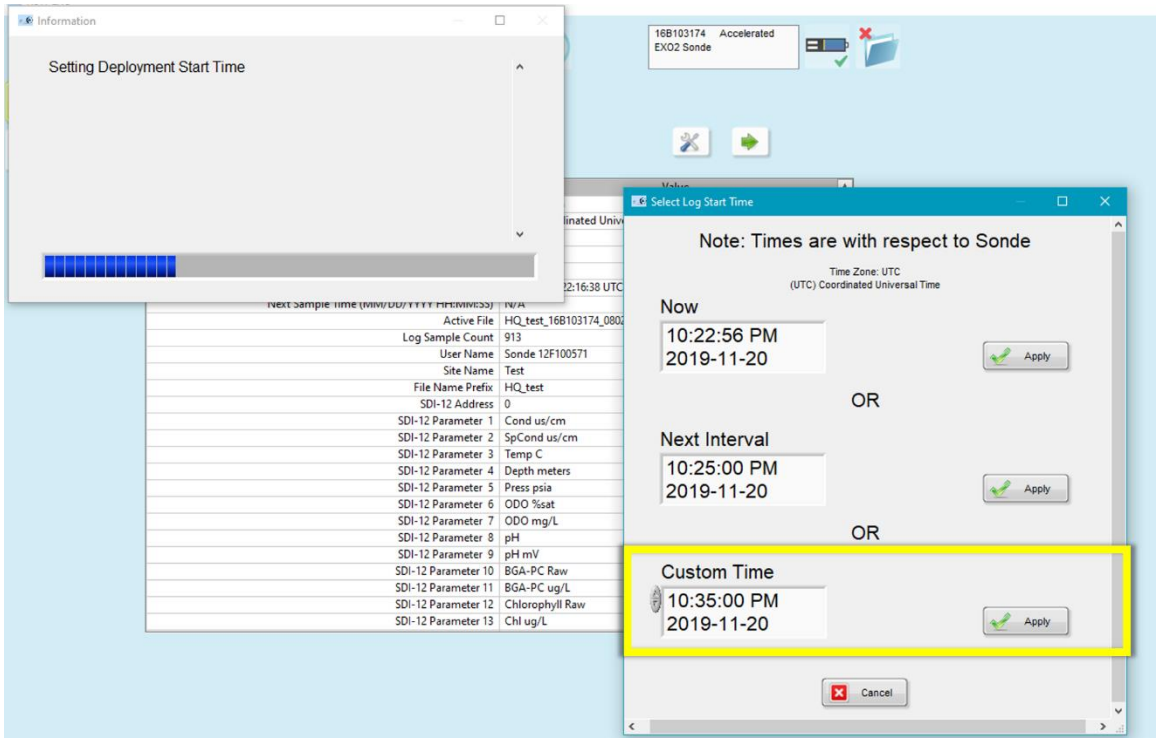

Figure 8. Select a Custom Time ~10 Minutes from the Current Time to Start on an Even 5 Minute Interval

7. After the settings load, confirm that logging is enabled by clicking on **Read Current Sonde Settings**. Logging is enabled if the "**Stop Deployment**" button displays and Logging "**Enabled**" is indicated in the Current Deployment Summary table. (Figure 9).

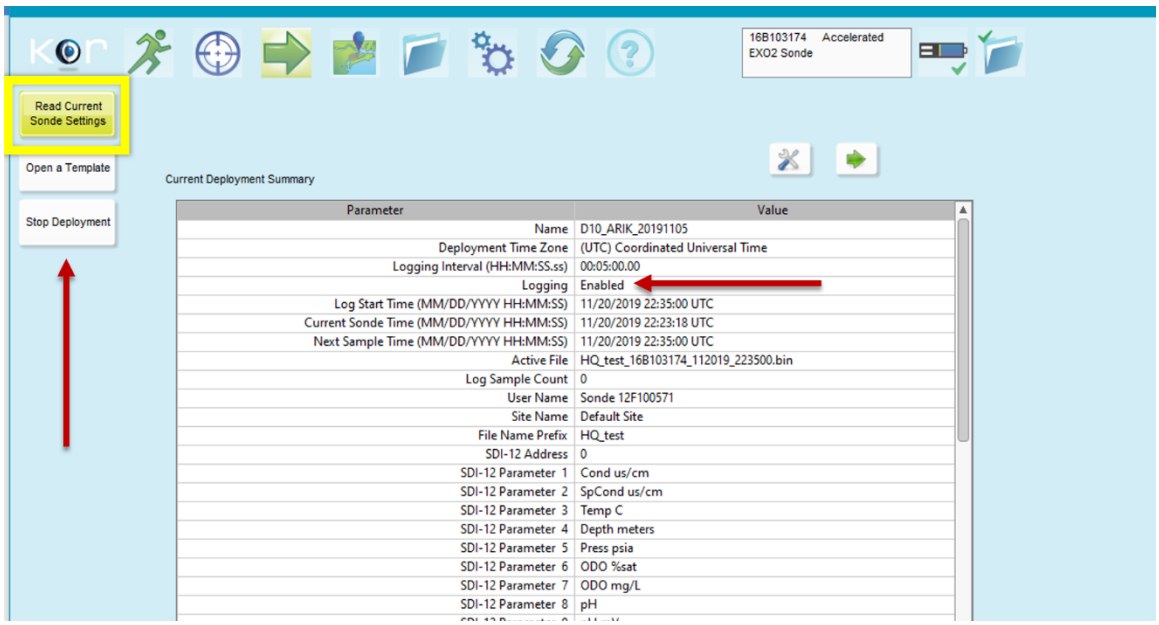

Figure 9. Read Current Sonde Settings to Verify Logging is Enabled

4.4 Disable Logging Procedure

Disable logging when removing the Sonde from the water to prevent the collection of bad data. If unable to cease logging immediately, note the time/date when the sensors were out of the water and use the trouble ticketing system to communicate the time range for bad data to HQ science for possible manual flagging.

1. Open the KorEXO software and navigate to Deployment settings, reference Step 1 in Section 4.3, Figure 3. Navigate to Deployment Settings. Click "**Stop Deployment**" to stop the Multisonde from collecting data (Figure 10).

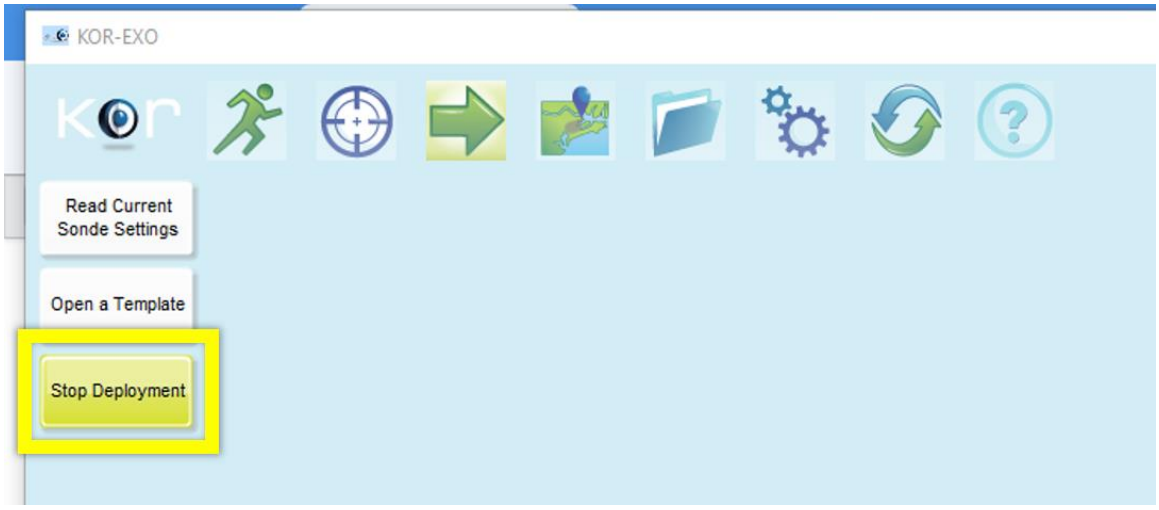

Figure 10. Click "Stop Deployment" to Stop the Multisonde from Collecting Data

2. A **Stop Deployment** dialogue box will appear asking for confirmation and acknowledgement to stop data collection (Figure 11). Click "**Apply**" to confirm and "**OK**" to acknowledge and proceed to the next section.

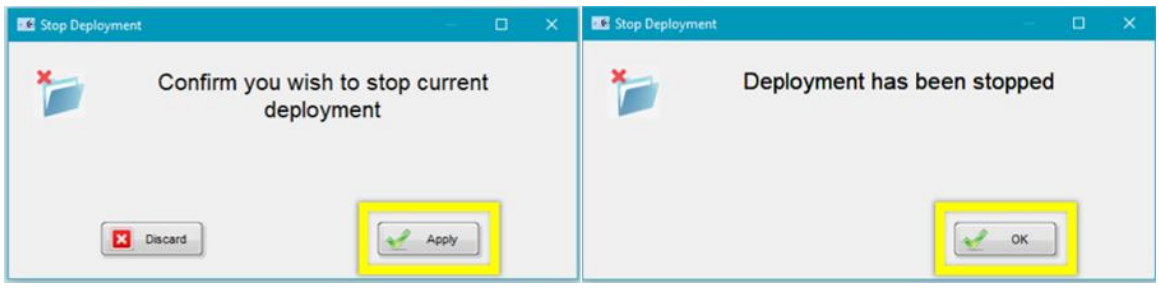

Figure 11. Confirm and Acknowledge Deployment is being Stopped

4.5 Data Download Procedure

Download the Multisonde files onto a laptop to transfer them to the network drive for AQU SCI on a biweekly (every two weeks) preventive maintenance cycle. Follow the instructions in this section, in addition to using the following file naming convention per Section 4.7 when uploading the files to the **Sensor Swap** > **Sonde** folder: **DXX_SITE_yyyymmdd_Serial#**

1. In the KorEXO software, select the blue file folder in the top menu bar to download the data (Figure 12).

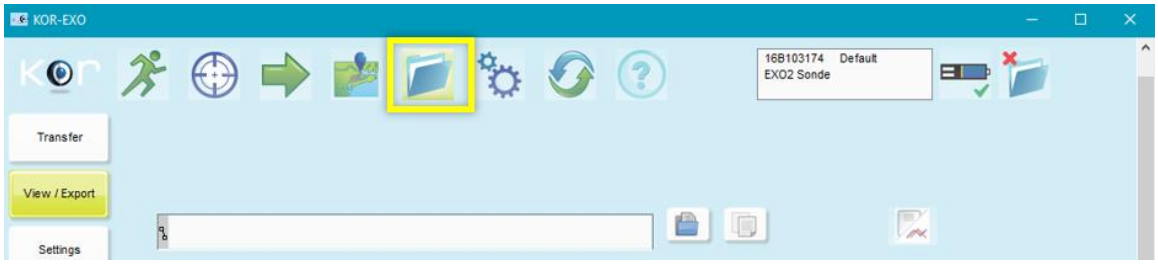

Figure 12. Select the Blue File Folder to Download the Data

2. Select “View/Export” (Figure 13).

Figure 13. Select "View/Export"

3. Select the file you wish to download by clicking the smaller blue file folder icon (Figure 14).

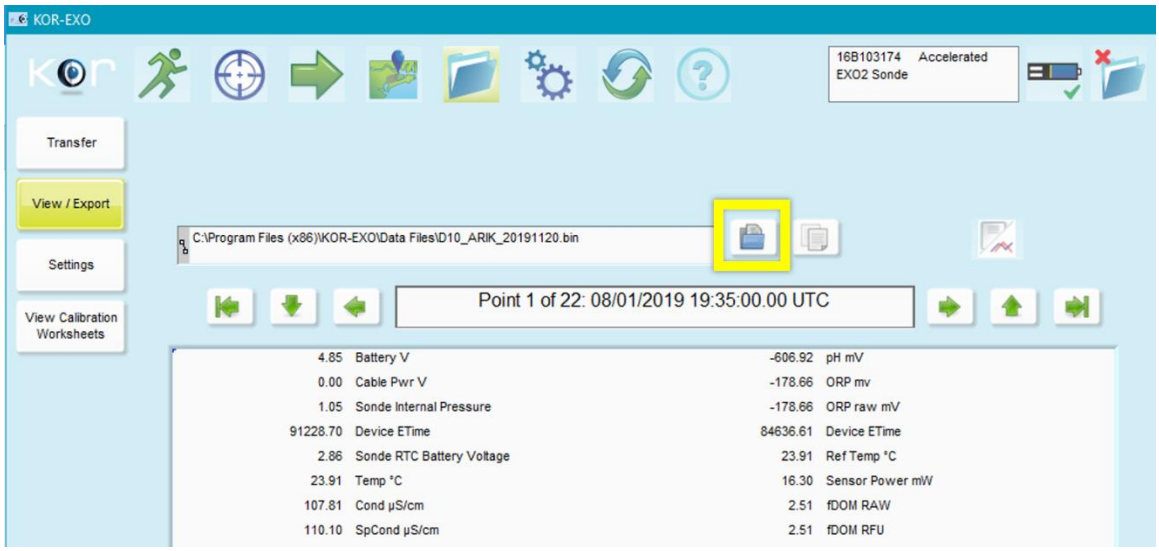

Figure 14. Select the Smaller Blue Folder Icon to Select the Log File to Download

4. In the **Select File** window, click on the file created when the logging was initially enabled (see Section 4.3) and then click “**OK**” (Figure 15).

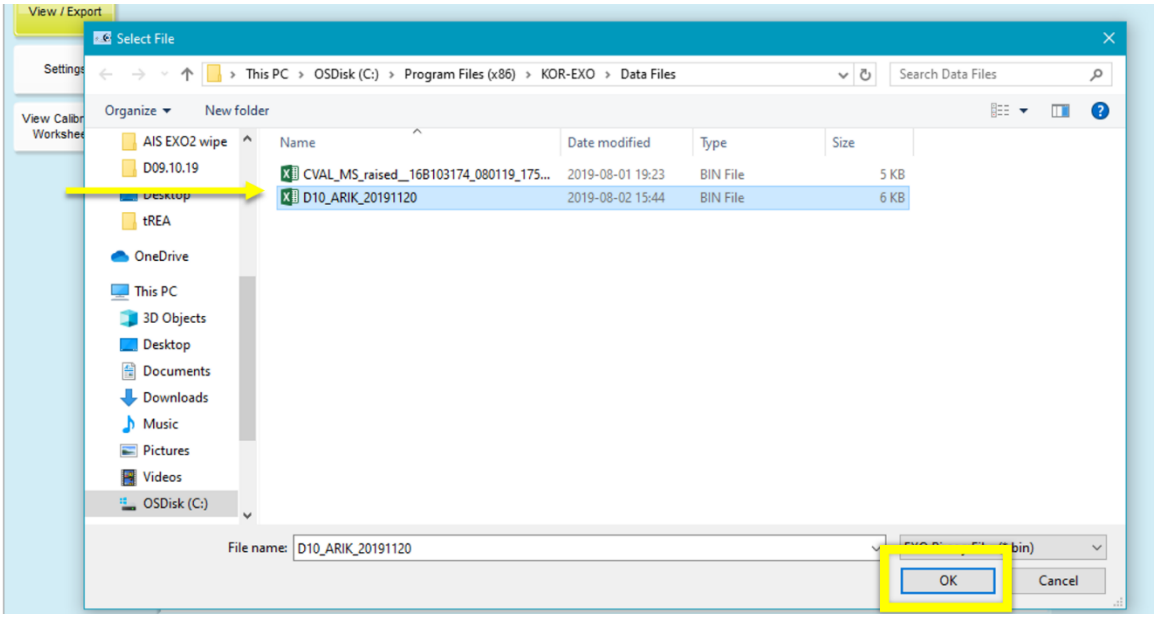

Figure 15. Select File to Download

5. Click on the paper icon to export the data to CSV (called a **KOR Export File** in Figure 16).

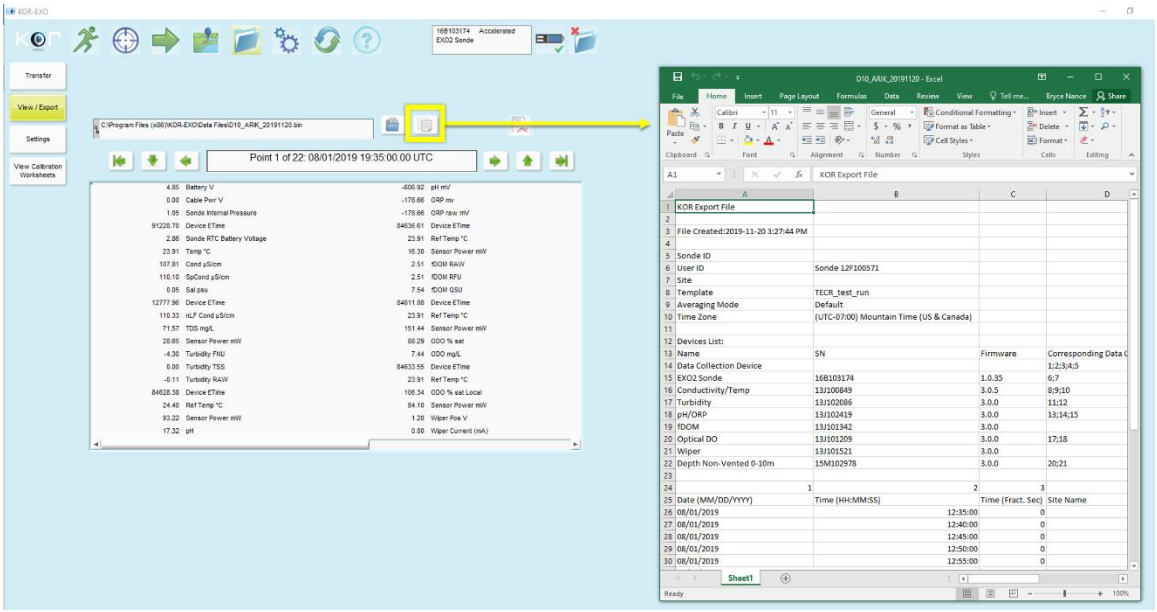

Figure 16. Export Data to MS Excel

6. Save the file to your computer to upload the file to the network drive per Section 4.7.

4.6 Deleting Data File Procedure

The Multisonde has an internal logging memory capacity of 512 MB. At the sampling interval of 5 minutes, the Multisonde has the capacity to hold files for a long duration (12+ months). When initiating a new deployment, clear all log files from previous deployments.

4.7 Data Upload Procedure

After returning to the Domain Support Facility or via VPN, change the name of the log files to "**DXX_SITE_yyyymmdd_Serial#**" where "**DXX**" is the domain, "**SITE**" is the location, "**yyyymmdd"** is the date of the data download, and "**Serial#"** is the serial number found on the Multisonde body bar code label. Save a copy to the Network drive in the following folder (Figure 17):
N:\Science\Sensor Swap\Sonde

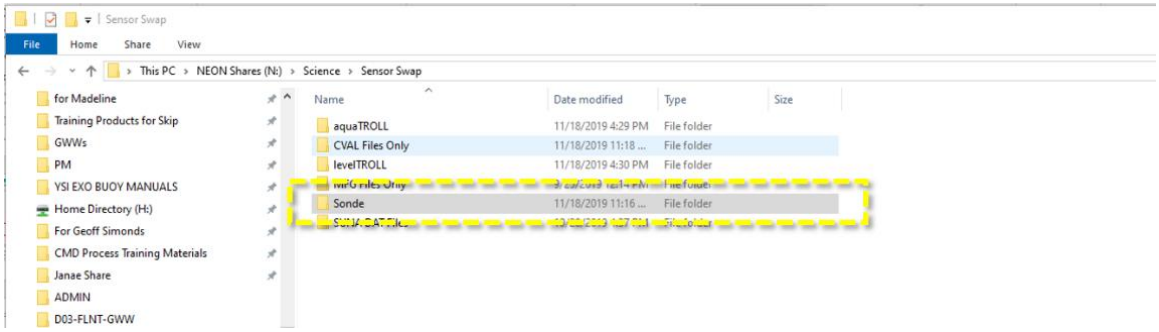

Figure 17. N:\Science\Sensor Swap\Sonde

The serial number on the Sonde is located under the EXO2 model label barcode (16B103174 is the serial number in Figure 18 below).

Figure 18. Multisonde Serial Number Location

Maintain a local copy of the files for at least two (2) years to have backup files in the event of an emergency (if HQ requires files to be re-uploaded to another or same location).