

Virtual Beach 3.0.6 – Making “Nowcast” Predictions

In this module you will learn how to:

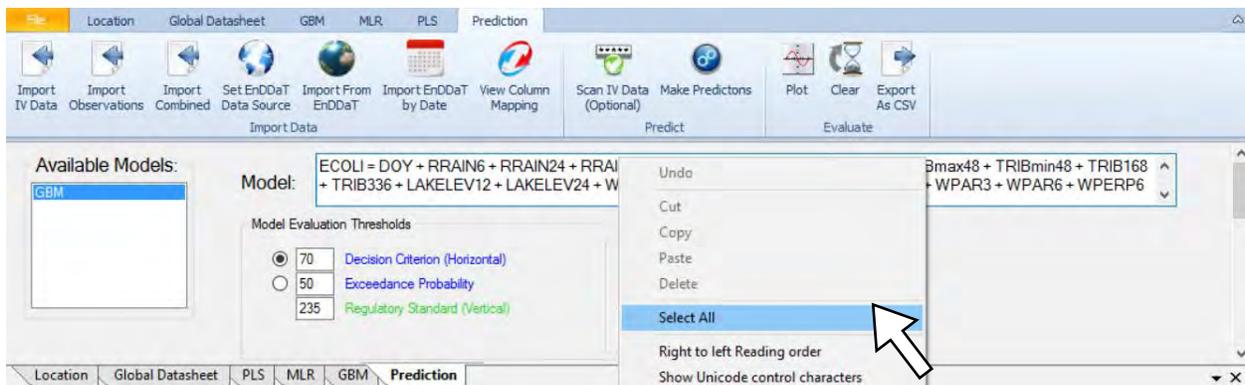
- A. Create a real-time connection to Web data services through EnDDaT
- B. Download real-time data to make a “Nowcast” prediction
- C. Save a Virtual Beach file with prediction results

A. Create a real-time connection to Web data services through EnDDaT

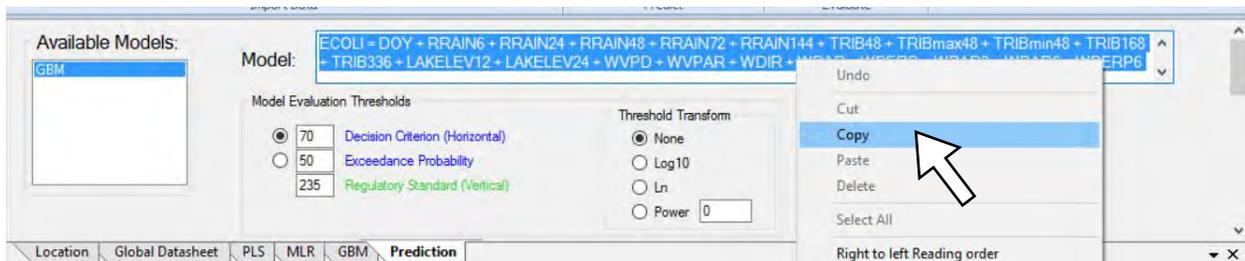
A critical feature with Virtual Beach version 3 is the ability to download data from EnDDaT directly into the Prediction Tab. EnDDaT enables users to build custom URLs to download pre-processed data on any number of hydro-meteorological conditions anywhere in the Great Lakes.

Once created, embedding an EnDDaT URL within a Virtual Beach file enables nowcast operators to predict water quality conditions within minutes from any computer with Virtual Beach and an internet connection.

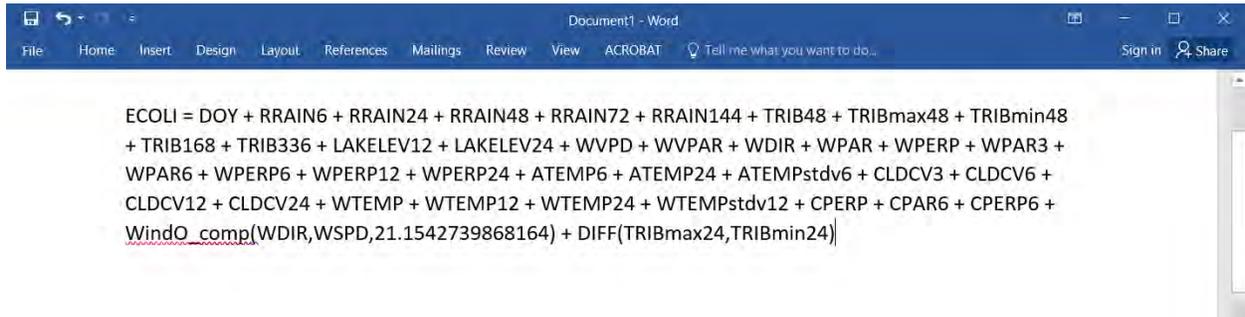
A.1. On the “Prediction” tab, click the model of interest. In a single Virtual Beach project file, three models can be created: MLR, GBM, or PLS. Once the model equation appears in the box to the right of the word “Model”, highlight the entire Model equation by right-clicking on the equation in the box and selecting “Select All”.



A.2. Copy the highlighted equation to the computer’s clip board, either by right-clicking again on the equation and selecting “Copy,” or by typing Ctrl-C.



A.3. Paste (Ctrl-V) the copied text into a Word or other text program document. Find the original variables in the equation. If you have transformed or manipulated any of the independent variables when creating a model, look for the untransformed and un-manipulated variables in the equation. The variables will be in the core parentheses or brackets within the longer variable strings. In the example below, WDIR, WSPD, TRIBmax24 & TRIBmin24 are components of the last two terms of the model.



A.4. From the VirtualBeach.org training page, download and open the MS Excel file called 'ENDDAT_URLs_BlueHarbor.xlsx'. This excel file is a simplified way of generating a url to request data from EnDDaT. The exact same data can be downloaded using the EnDDaT user interface with a few more steps in processing (i.e. summing rain totals for 24, 48, and 72 hours).

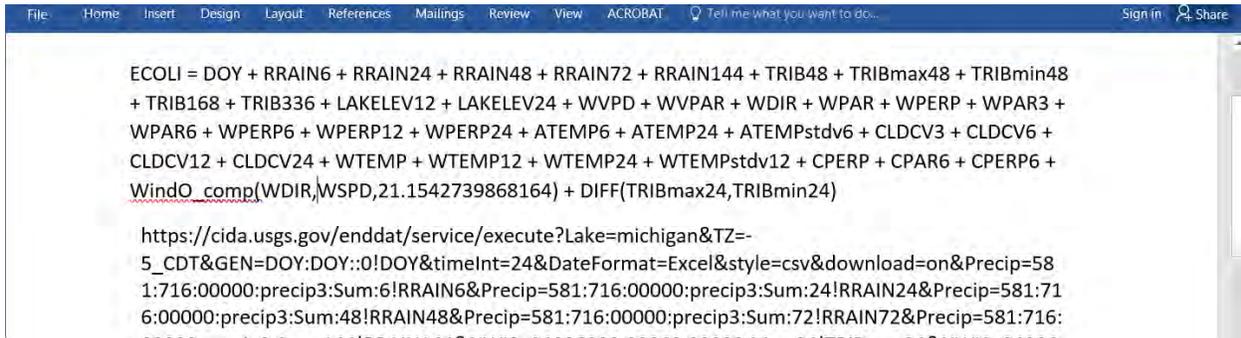
Once the file opens, click on the worksheet that applies to the model you are working with: either "Model Operation MLR" or "Model Operation GBM". The cell AB15 is labeled "Potential Variables" and below is an extensive list of common Nowcast variables available from the EnDDaT system. Using the variables in your model equation as a reference, search for the matching variables and type "y" in the yellow cell adjacent to the variable name. In this example, 39 independent variables are in the GBM model and indicated with a "y" on the "Model Operation GBM" worksheet. Note that the variable "DOY" is included in the URL if "Yes" is entered in the cell C10.

A	B	C	D	E	F	G
10	Include Day? (see Notes ⁵): Select from →	Yes				&GEN=DOY:DOY::0IDOY
11	Allowable time gap: Hours	24				&timeInt=24
12	Date Format	Excel				&DateFormat=Excel
13	Data Format	Comma-Separated Values				&style=csv
14	Data Download	Yes				&download=on
15	Potential Variables (see Notes⁵): Type "y"	Geo Location (see Notes⁷): →				Find Geo Locations (Map: cida.usgs.gov/endedat/dat)
17	Radar-Estimated Rainfall:		Radar-X	Radar-Y		1-Hour National Precipitation Grid (📍)
18	y RRAIN6		581	716		&Precip=581:716:00000:precip3:Sum:6IRRAIN6
19	y RRAIN24		581	716		&Precip=581:716:00000:precip3:Sum:24IRRAIN24
20	y RRAIN48		581	716		&Precip=581:716:00000:precip3:Sum:48IRRAIN48
21	y RRAIN72		581	716		&Precip=581:716:00000:precip3:Sum:72IRRAIN72
22	y RRAIN144		581	716		&Precip=581:716:00000:precip3:Sum:144IRRAIN144

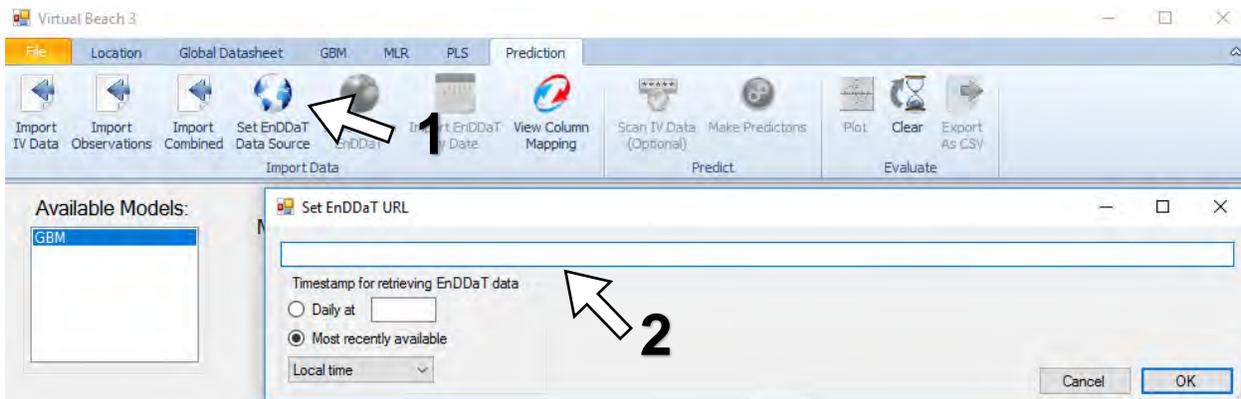
A.5. Find the cell highlighted in orange in the second row to the right of "EnDDaT Data Download URL (see Notes¹) →". This is the EnDDaT URL for your selected variables. Copy (right-click or Ctrl-C)

	A	B	C	D	E	F	G			
1	<p>Accessing Online Hydro-Meteorological Data for 'Virtual Beach' Models (1.2) www.seagrant.wisc.edu/VirtualBeach</p>									
2	<p>'EnDDaT' Data Download URL (see Notes¹) →</p>		<p>https://cida.usgs.gov/enddat/service/execute?Lake=michigan&TZ=-5_CDT&GEN=DOY:DOY::0!DOY&timeInt=24&DateFormat=Excel&style=csv&download=on&Precip=581:716:0000:581:716:00000:precip3:Sum:24!RRAIN24&Precip=581:716:00000:precip3:Sum:48!RRAIN48&Precip=581:716:00000:precip3:Sum:144!RRAIN144&NWIS=04086000:00060:00000:Max:24!TRIBmax24&NWIS=04084&NWIS=04086000:00060:00000:Mean:48!TRIB48&NWIS=04086000:00060:00000:Max:48!TRIBmax48&NWIS=min48&NWIS=04086000:00060:00000:Mean:168!TRIB168&NWIS=04086000:00060:00000:Mean:336!TRIB336&</p>							
3	<p>URL Purpose (see Notes²): Select from →</p>		<p>Model Operation</p>							
4	<p>Beach Name & Location (for reference only)</p>		<p>Blue Harbor, Sheboygan Co, WI</p>							
5	<p>Beach Orientation, 0-359° (see Notes³)</p>		<p>20</p>							
6	<p>Lake Name: Select from drop-down →</p>		<p>michigan</p>				Lake=michigan			
7	<p>'Year(s) (see Notes⁴): Copy from Column H</p>		<p>2013</p>							

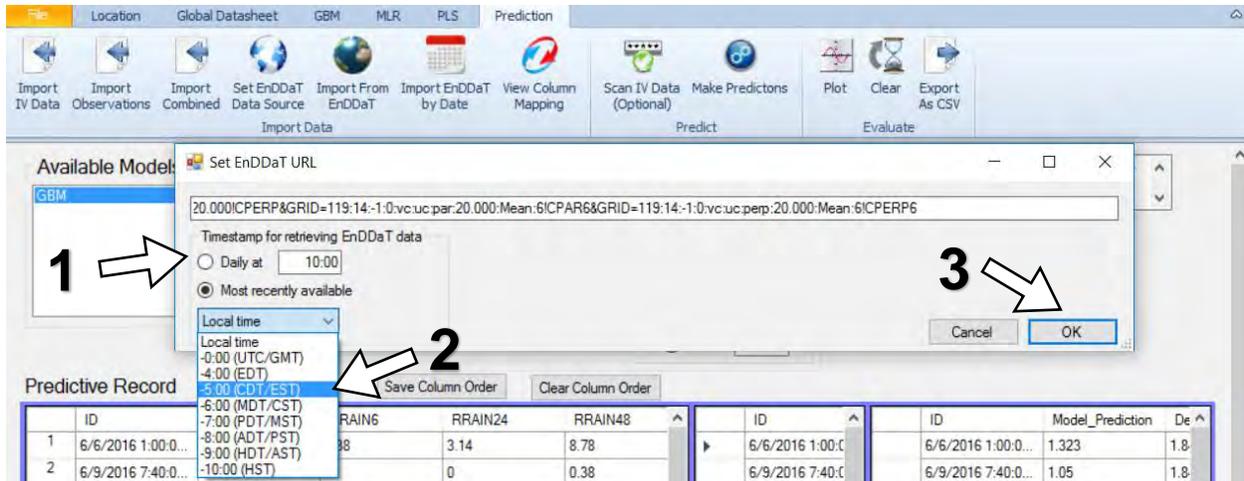
A.6. In the Word document or text editor that you created in step A.3 above, paste (right-click or Ctrl-V) the copied EnDDaT URL beneath the model equation to which it relates. Save this document as a reference file.



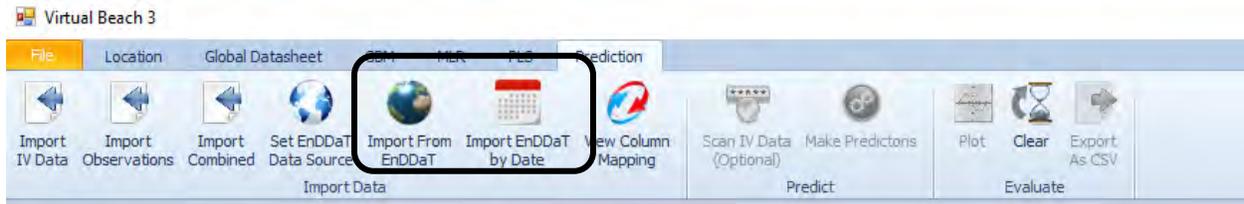
A.7. 1. Return to the Prediction Tab and click the "Set EnDDaT Data Source" button.
 2. In the window that opens, under "Set EnDDaT URL," paste (right-click or Ctrl-V) the copied URL into the blank space.



A.8. 1. Under “Timestamp for retrieving EnDDaT data,” click the radio-button for “Daily at” and type a time relevant for making advisory decisions, such as 10:00. 2. Under the pull-down menu, replace “Local time” with “-5:00 (CDT/EST),” or your own time zone. 3. Click “OK”.

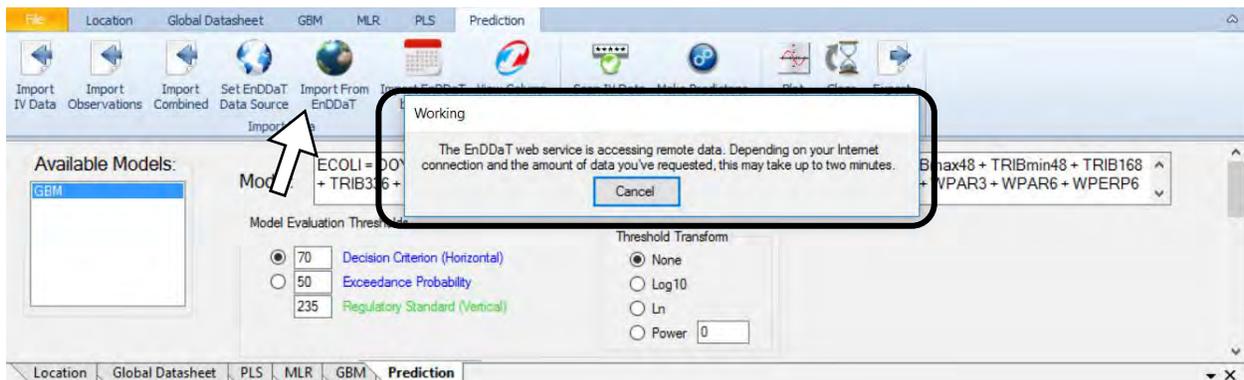


A.9. The “Import From EnDDaT” & “Import EnDDaT by Date” buttons (which was previously inactive) should now be activated. (Don’t click on either button yet. We’ll use it in the next section)

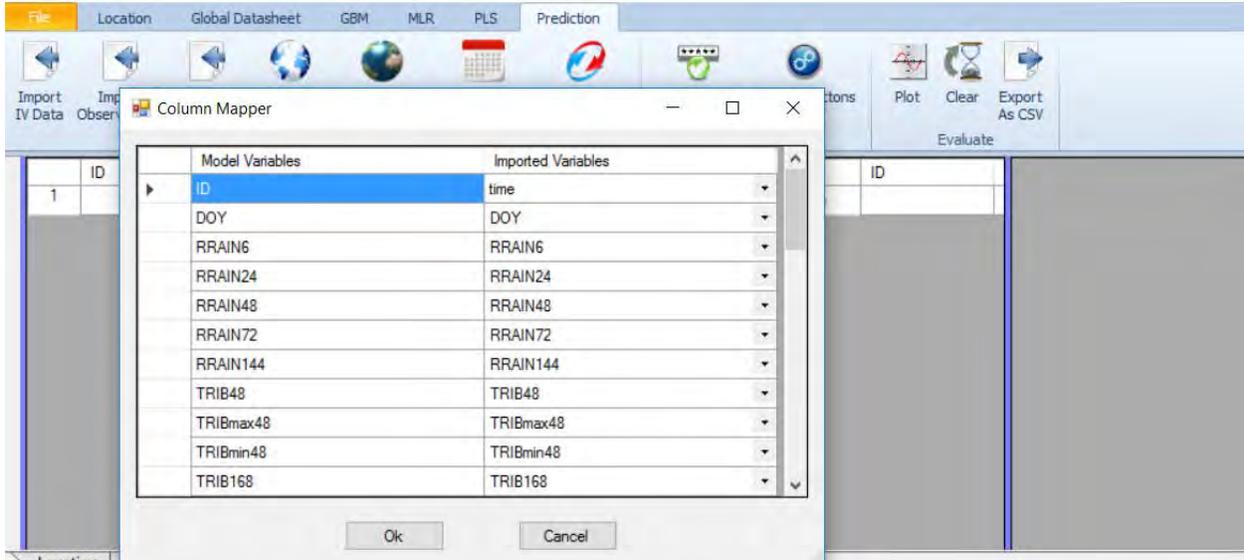


B. Download real-time data to make a “nowcast” prediction

B.1. Click the “Import From EnDDaT.” A pop-up will open indicating that Virtual Beach is in the process of downloading the data, which can take a few minutes depending on your internet connection and processor speed. An error message will appear if the download was unsuccessful.

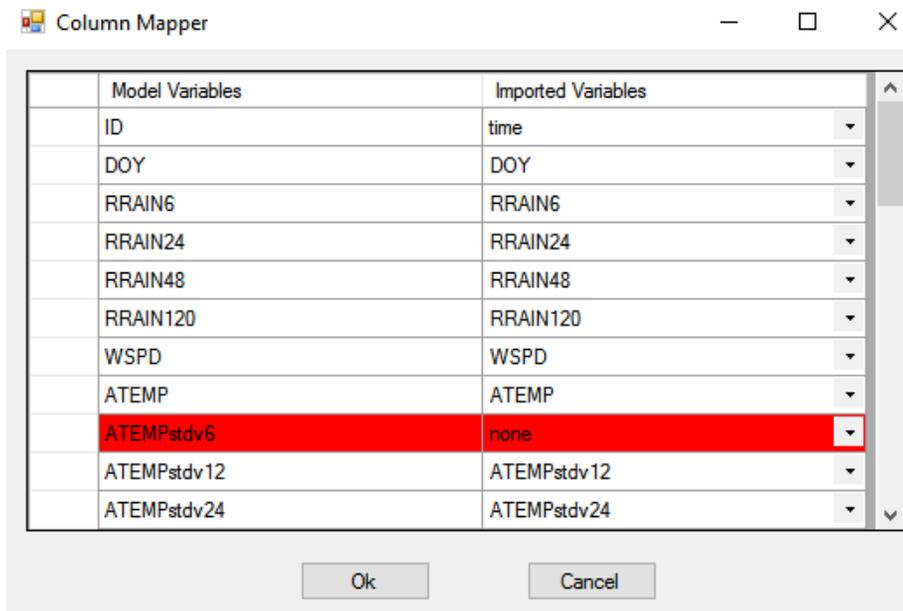


B.2. Since this is the first time you are downloading data into the Prediction tab, a “Column Mapper” window will appear – this will only happen the first time.



Since we are using the “url generator” file, the headers match nicely. However, in most cases, the names of the EnDDaT variables will be different than names of their corresponding ‘Model Variables’. It is therefore necessary to “map” these variables to one-another.

As illustrated below, “Model Variables” that do not have a corresponding “Imported Variable” (i.e., an EnDDaT variable with the same name) will be highlighted in red.



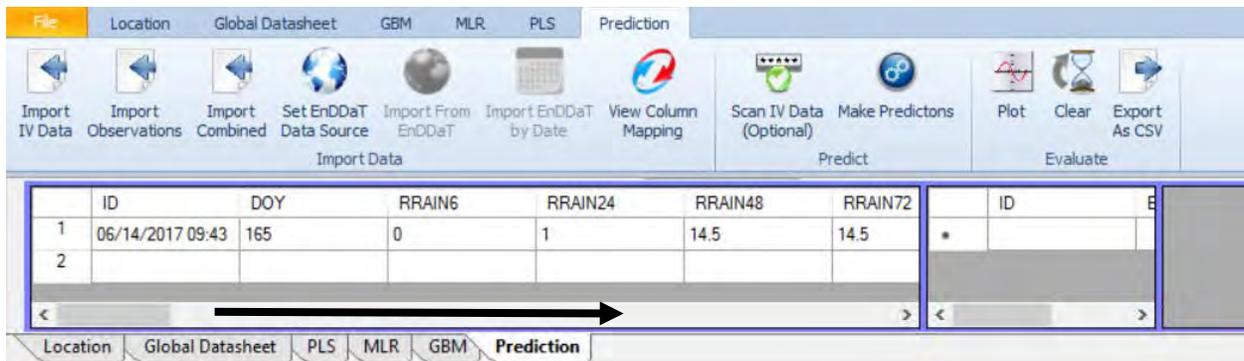
Note: If rows are highlighted in red, maximize the “Column Mapper” Window and expand the width of the ‘Imported Variables’ column (Step 1 below) to make room for very long variable names. Starting with first un-mapped EnDDaT variable, click each of the pull-down menus and select the corresponding EnDDaT variables.

Refer to the ‘7-ENDDAT_URLs_BlueHarbor.xlsx’ (Step A.4) to determine the correct Variable name.

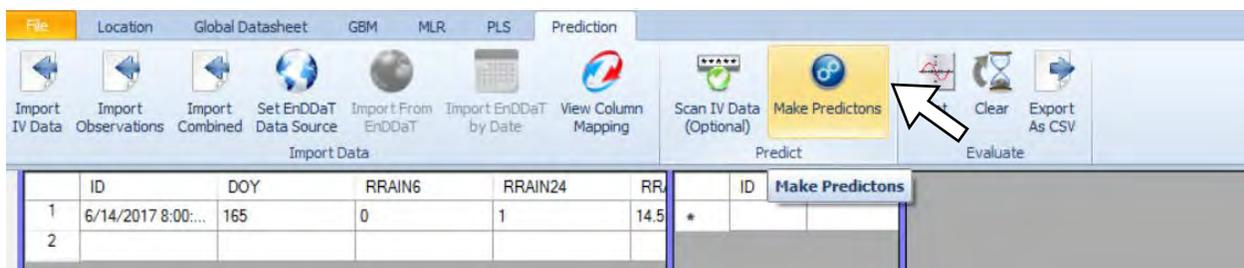
If your data set contains field-observed variables (e.g., field-estimated wave height) or any others that do not come from EnDDaT, do not map them; leave these rows highlighted red (i.e., none). Data for this and similar variables will have to be entered manually from your records.

Caution. Take your time with this step. Be careful not to map the wrong variable names or the nowcast predictions will be based on the wrong input values. When you have finished, click “OK.” This will return you to the ‘Prediction’ tab.

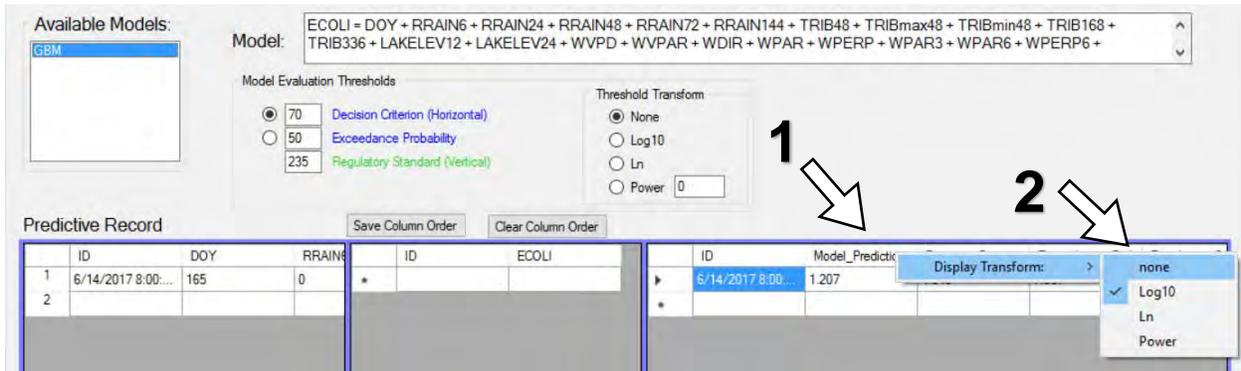
B.4. Note that a new row has been added to the left-hand panel of the ‘Predictive Record’. Scroll to the right to see the real-time data downloaded from EnDDaT.



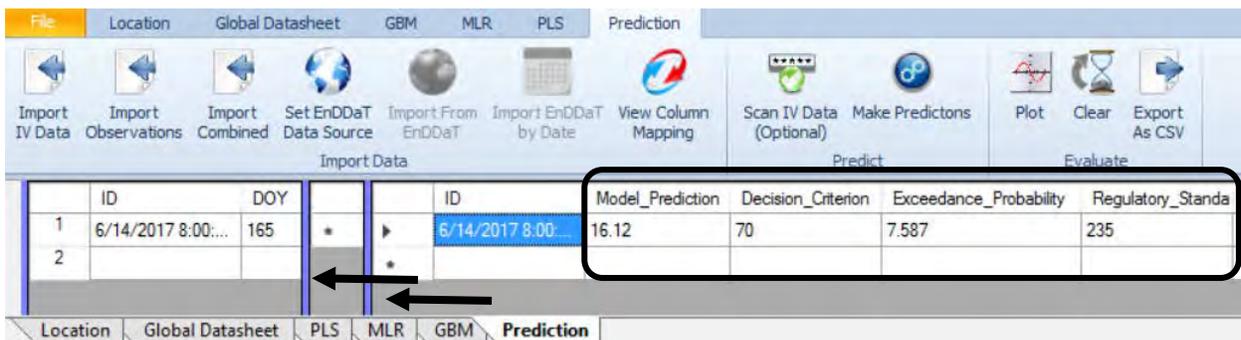
B.5. Click “Make Predictions”. Note when the prediction appears, it is in Log-scale.



B.6. 1. Right-click on the column header for “Model_Prediction.” 2. Under the pull-down, select ‘None’ (to un-transform the predicted concentration of E. coli).



B.7. Re-size the columns in the right-hand panel to view the pertinent information. “Exceedance_Probability” is based on the selected Decision Criterion, in this example, 70 CFU). Any prediction above this value – *regardless of whether it is higher than 235* – will have a corresponding exceedance probability above 50%. In this example, the model predicts the bacteria today to be 16.12 CFU with a 7.587% chance of the level being above the standard of 235.



C. Save a Virtual Beach file with prediction results

C.1. When you save the completed and validated nowcast predictions, all of the input, output, and validation data are saved. When saving your model file, over-writing the existing file will not change the model. Instead, the new predictive records are simply added.

Updating and re-saving model files is a good way to track the performance of your nowcast model over the course of a beach season. If the nowcast proves to perform poorly, you can revisit the model-building and evaluation process (Modules I and II) and validate the revised nowcast model.