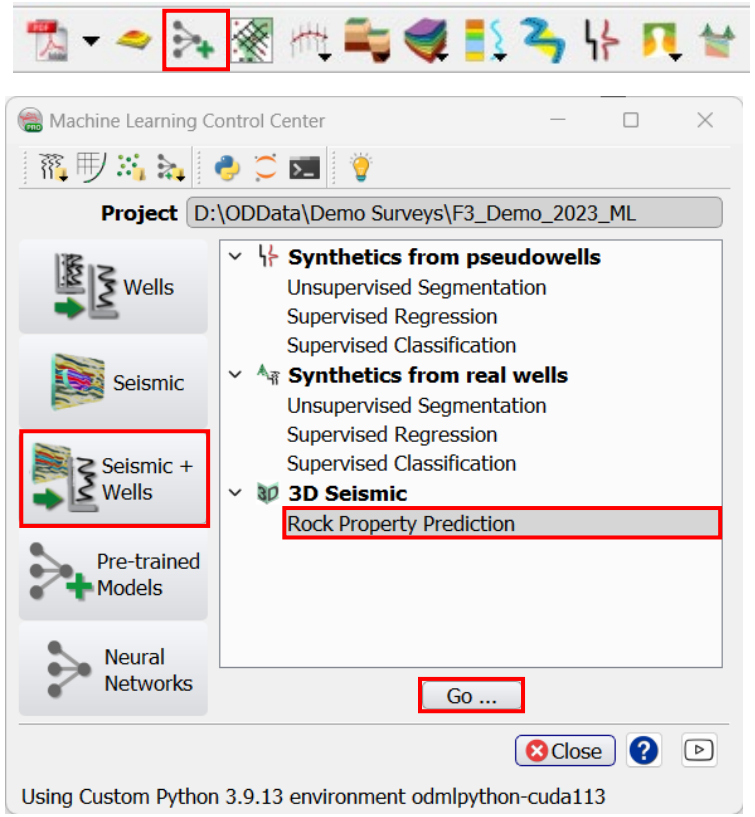
Exercise objective:

To predict rock property using the *3D Seismic + Wells, Rock Property Prediction* tool which is part of the Machine Learning plugin. In this exercise, we want to predict a Porosity cube.

Well data Preparation
Seismic (and/or attributes) and **Well**(s) need to be available in the survey. If not, **import** seismic and wells (track, logs, markers, time-depth curve or checkshot).

Workflow:

1. **Open** the Machine Learning Control Center with the  icon .
2. **Click** on Seismic + Wells > 3D Seismic
3. **Select** Rock Property Prediction, and **Press Go**.



Workflow cont'd:

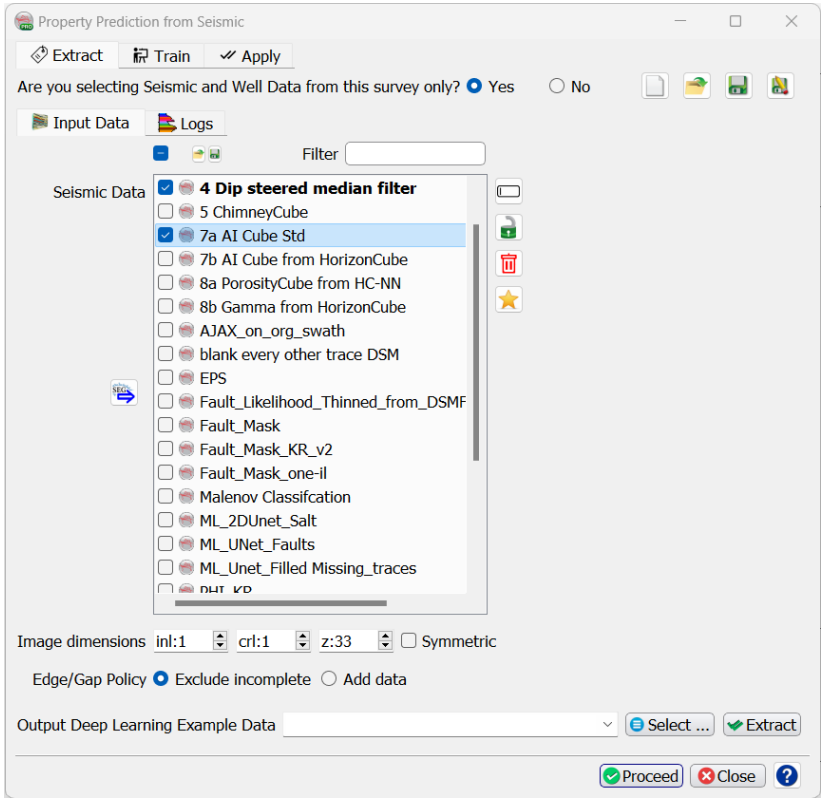
4. The "Property Prediction from Seismic" window pops up.

5. **Select** the *Extract* and *Input Data* tabs.

For seismic attributes, select 4 Dip steered median filter and 7a AI Cube Std

6. **Select**: *Survey*, *Target Log (e.g. Porosity)*, and *Wells* as indicated in the window.

7. **Press** the *Logs* Tab.



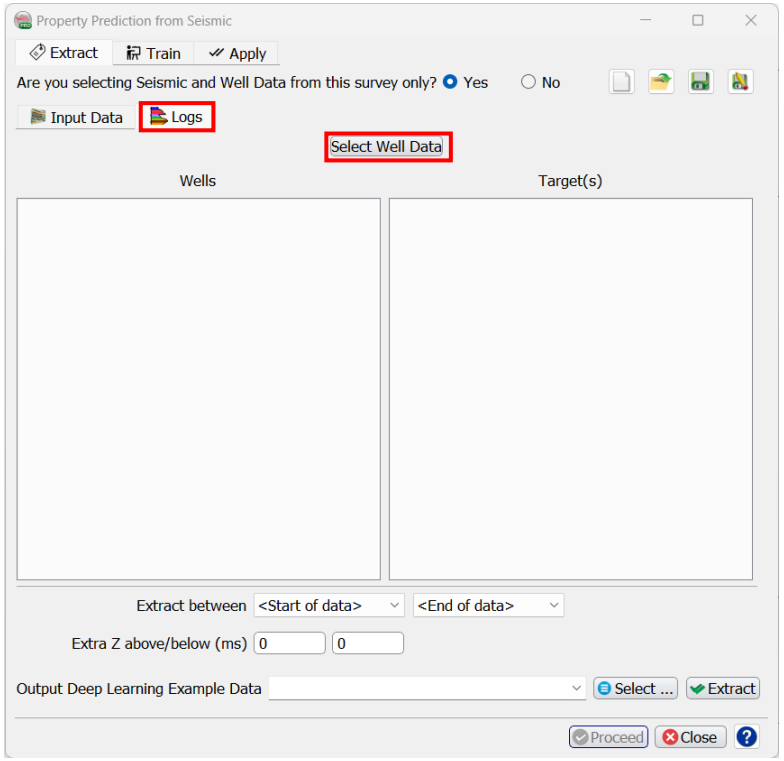
Workflow cont'd:

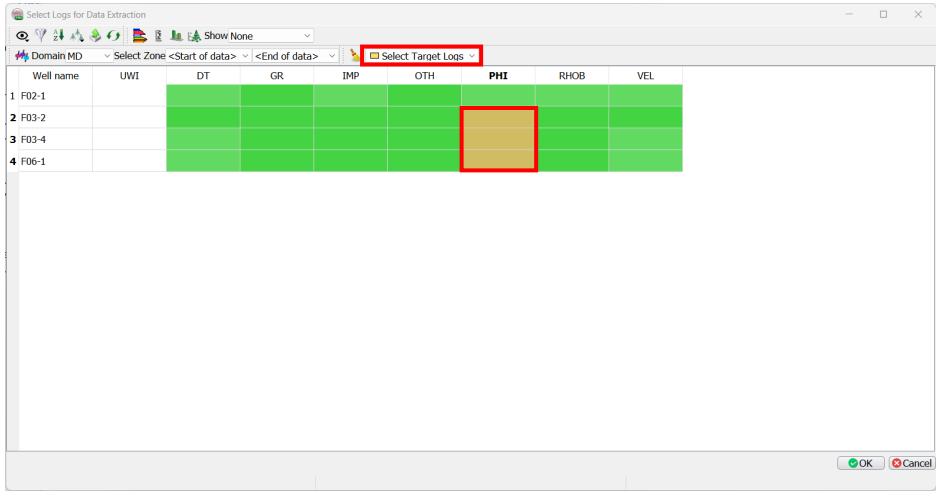
8. **Click** the 'Select Well Data' button

9. In the ''Select Logs for Data Extraction'' window, **Select** the *PHI (Porosity)* logs for wells F03-2, F03-4 and F06-1 by *left clicking* and *dragging* to select them. Observe that the 'Select Target Logs' needs to be set in the drop-down menu. Once selected, the green color for the logs turns yellow, indicating that they have been selected.

10. Press OK.

The well F02-1 is not selected, and will be used as a blind well.





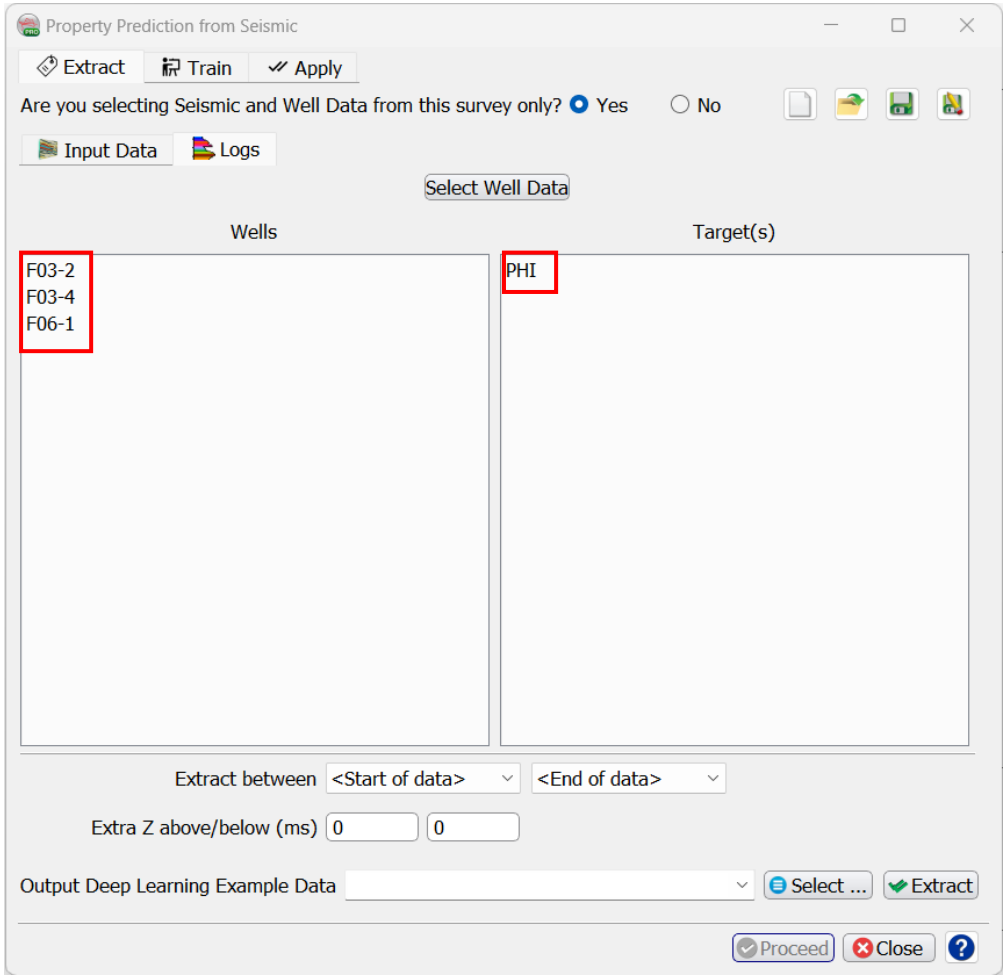
Workflow cont'd:

11. The *"Input Data"* and *"Logs"* tabs should now be set

> Input data can be modified using the "Select Well Data" button. Keep the default parameters as indicated in this window.

12. Specify a new name for the *Output Deep Learning Example Data (e.g. DL_Example_Data_Porosity_st1x1x33z4)*

13. Click "Extract"



Workflow cont'd:

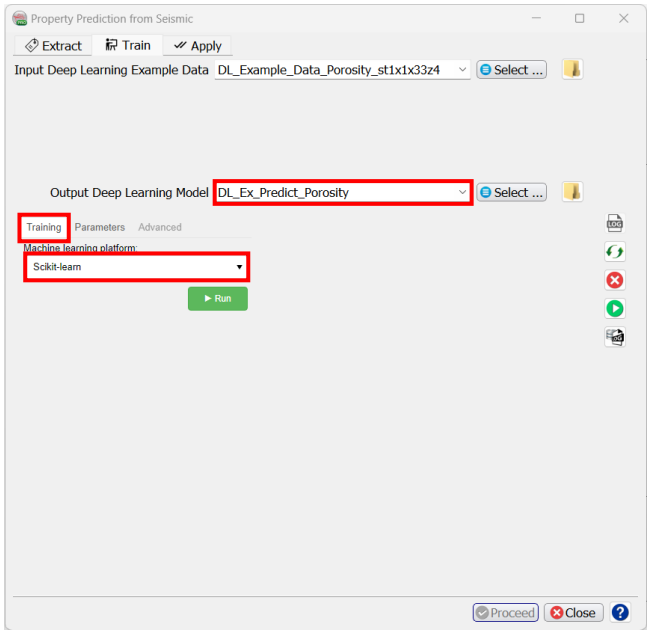
14. The *Train* tab gets activated. Train the extracted examples data using the default learning algorithm Scikit-learn (Ensemble: Random Forests).

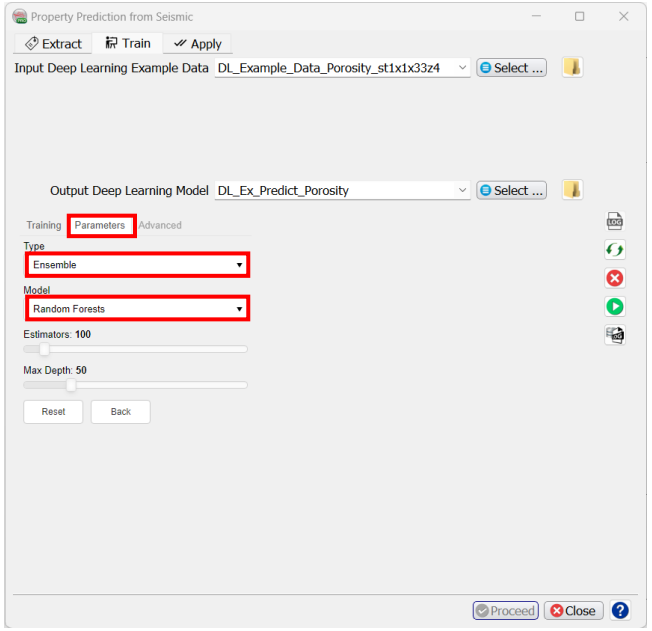
> Different machine learning platforms and parameters can be tested.
> Keep the default parameters for this exercise.

15. Specify a new *Output model* name e.g. DL_Ex_Predict_Porosity.

16. Under the *Parameters* Tab, **select** "Ensemble" and "Random Forests"

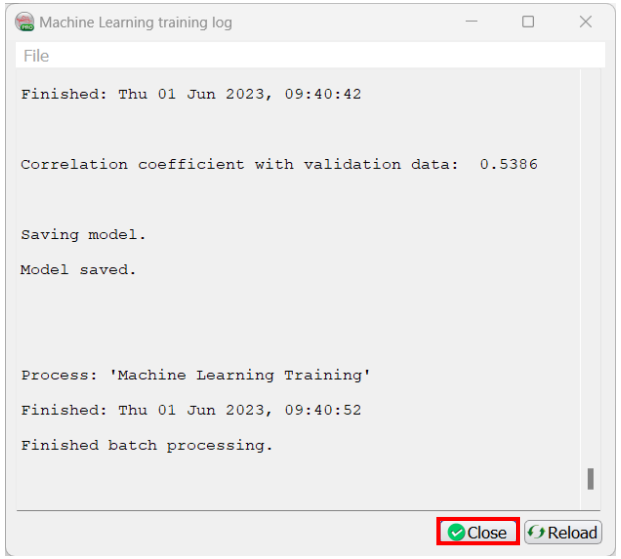
17. Go back to the "Training" tab and **Press** Run.

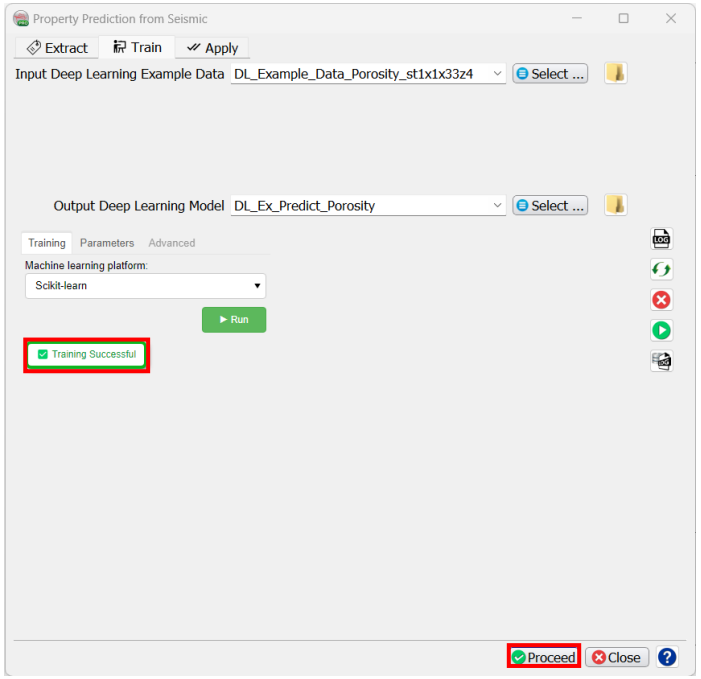




Workflow cont'd:

18. **Press** Close in the ''Machine Learning training log'' window, when the processing finishes, indicated by the line "Finished Batch Processing"



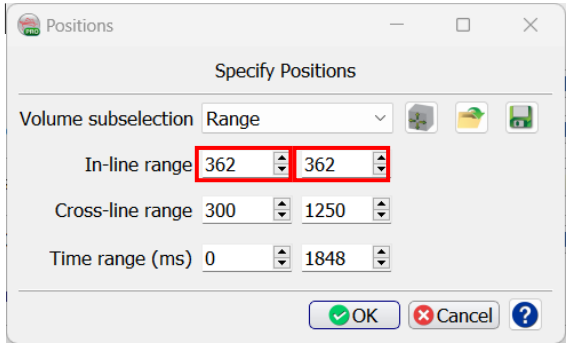


Workflow cont'd:

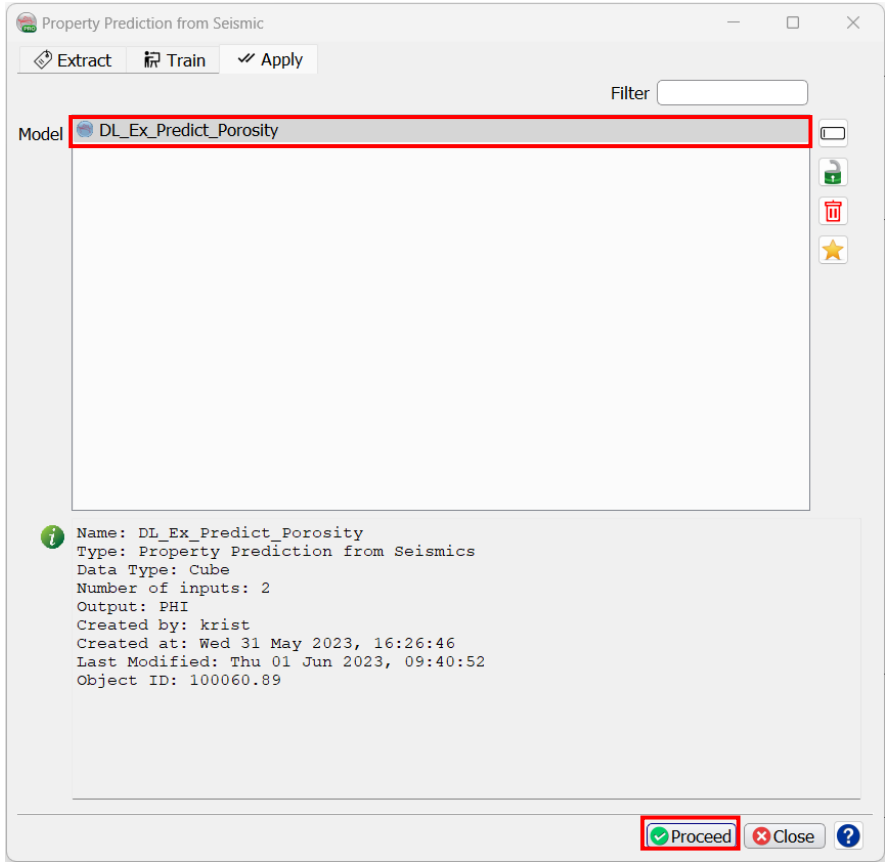
19. In the Apply tab, **Select** the Model and **press** Proceed..

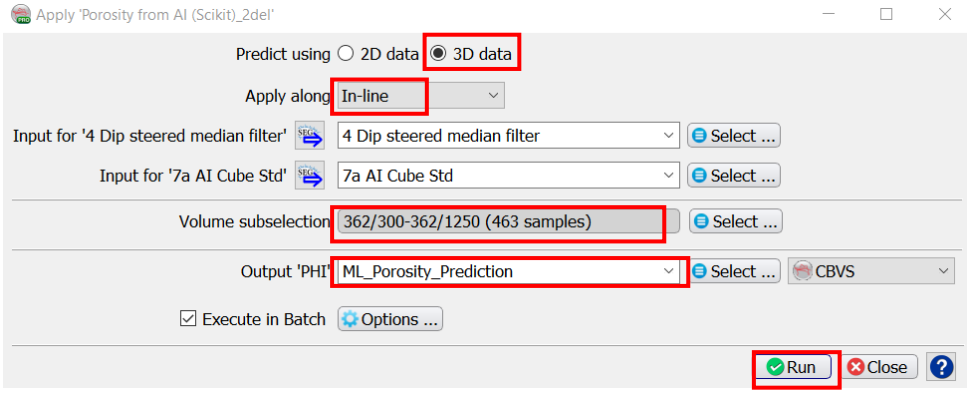
20. In the *Pop-up window,* **select** Predict using ''3D data'', "Apply along" → In-line. **Double-check** that the volumes are set correctly and give the output a name (e.g. ML_Porosity_Prediction)

21. Set the "Volume Subselection" as



22. Click "Run"



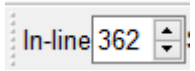


Workflow cont'd:

When the computation finishes, close the Progress Viewer window.

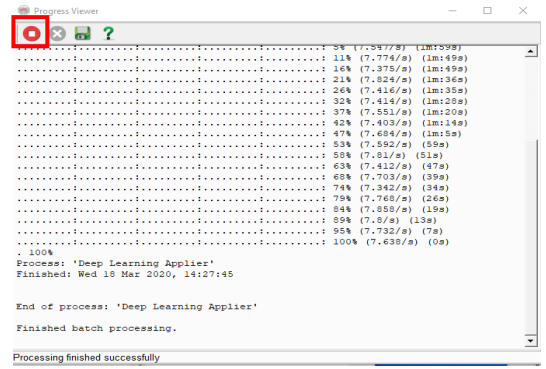
QC results by displaying the predicted Porosity on the test Inline, 362) and overlay the crossing well F02-1, with the porosity log.

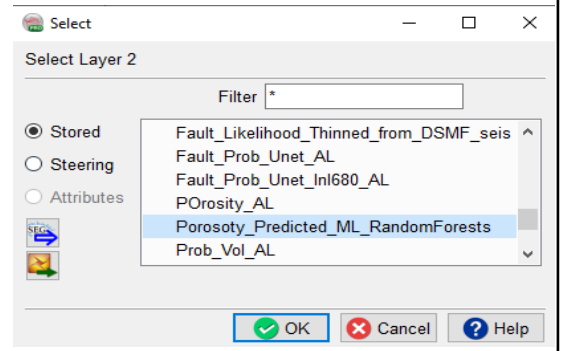
23. **Right Mouse Click** on the Inline folder > Add Default Data e.g. Deep Steered Median Filter. Type: 362 in the In-line field Change the In-line no to 362 .

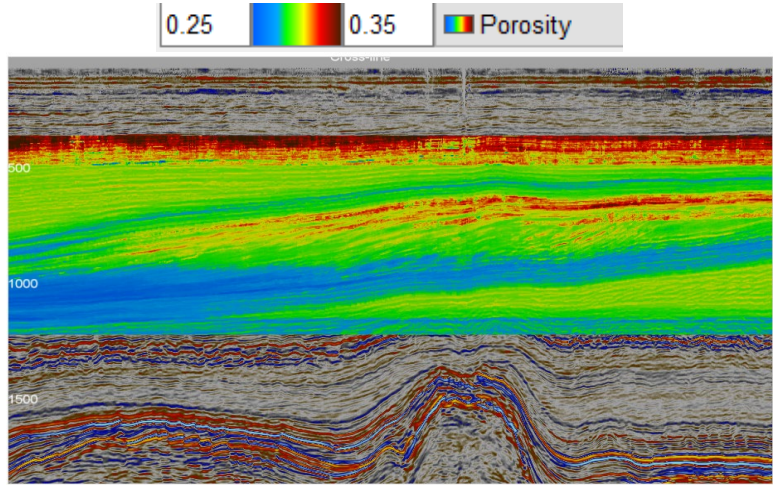


24. **Right Mouse Click** on the In-line 362 > Add > Attributes. **Select** under Stored the new predicted porosity (e.g. ML_Porosity_Prediction), and **Press** "OK".

25. **Modify** the Porosity colour limit to (0.25-0.35)





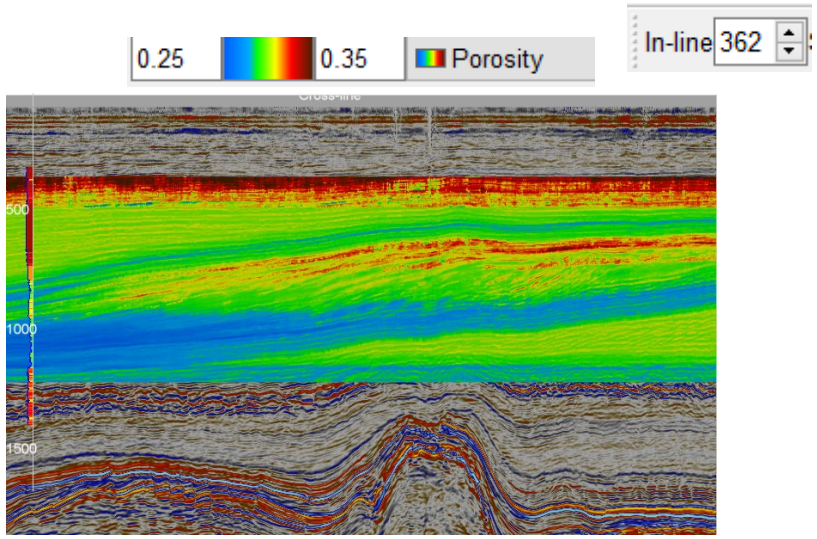


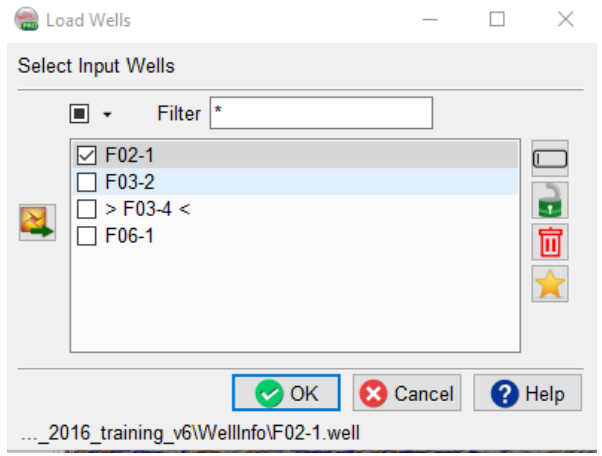
Workflow cont'd:

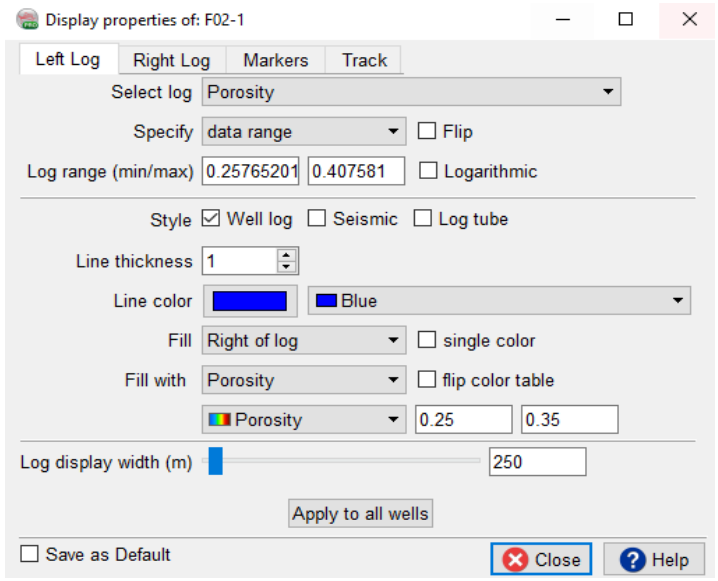
26. **Right Mouse Click** on the well folder> Add, **Select** the well F02-1, **Hit** Ok.

27. **Right Mouse Click** on the Well F02-1 > Display > Properties, **Select** Porosity log, **Change** the color bar to Porosity. **Modify** the Porosity color range similar to the predicted porosity cube range (0.25 - 0.35).

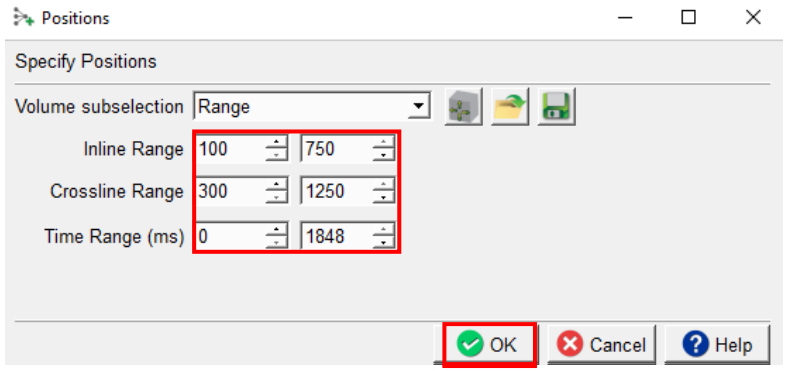
28. **Apply** to All Wells, and Hit Close.







Workflow cont'd:



If result is satisfactory, go back to the previous Step and **Apply** the trained model to the entire survey.

29. **Go back** to the Apply tab > Volume sub-selection > In-line range and reset of the entire range.

30. **Keep** all other default parameters and **Press** Run to continue.