

<><> Time Stamp <><>

Code started: 07/10/2022 - 11:50:17

Total Run Time: 12.154 s

<><> Bore Information <><>

Bore ID: GW036872.1.1

Region: Coastal

Bore Coordinates: (-30.923963, 153.044423)

Agency: WaterNSW

Drilled Date: 01/08/1990

Bore Depth: 30.5 m

Drilled Depth: 30.5 m

Reference Elevation: nan m

Time Series Reference Elevation: nan m

Land Surface Elevation: nan m

Silo Grid Point Coordinates: (-30.9, 153.05)

<><> Model Output <><>

Averaged Period: 30 day(s)

Output: Average Standing Water Level (m) in 1 period(s) time

<><> Model Inputs <><>

Data Range: 01/05/2010 - 31/08/2021

Train Set Size: 80.0%

Test Set Size: 20.0%

Input Timesteps: Current period + 2 preceeding period(s)

Input Variables:

Average Standing Water Level (m)

Average Rainfall (mm)

Average Absolute Deep Drainage (below 6m) (mm)

Average Absolute Root Zone Soil Moisture (0-100cm) (%)

<><> Data Quality <><>

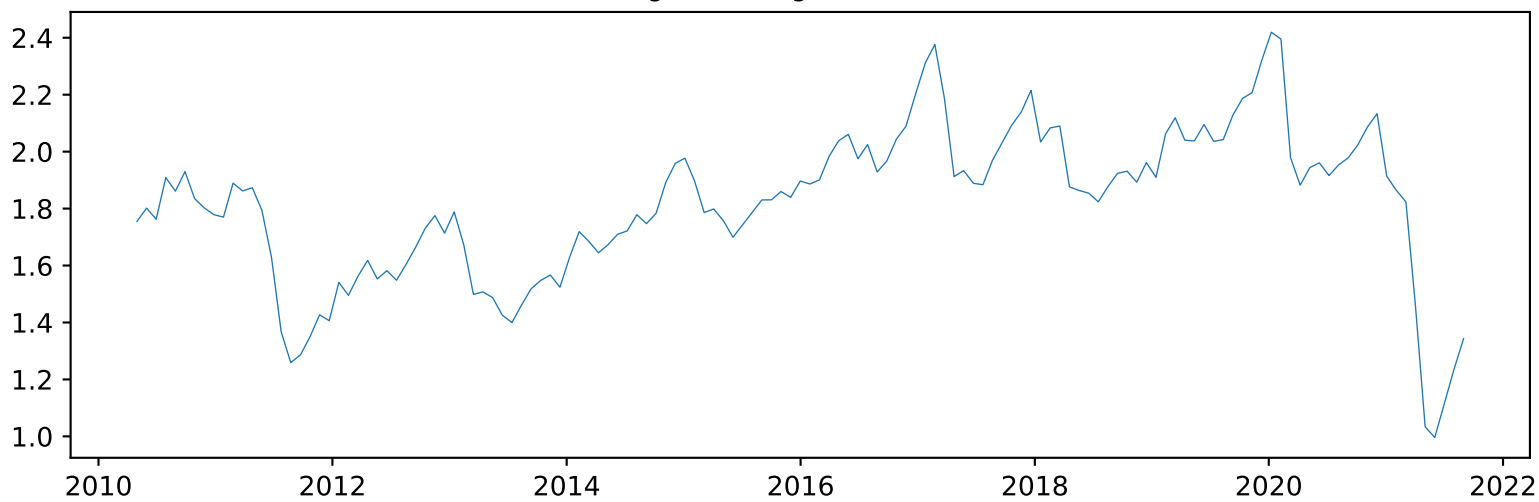
Interpolation Method: Spline

Quality Code: A, Number: 3434, Percentage: 82.33%

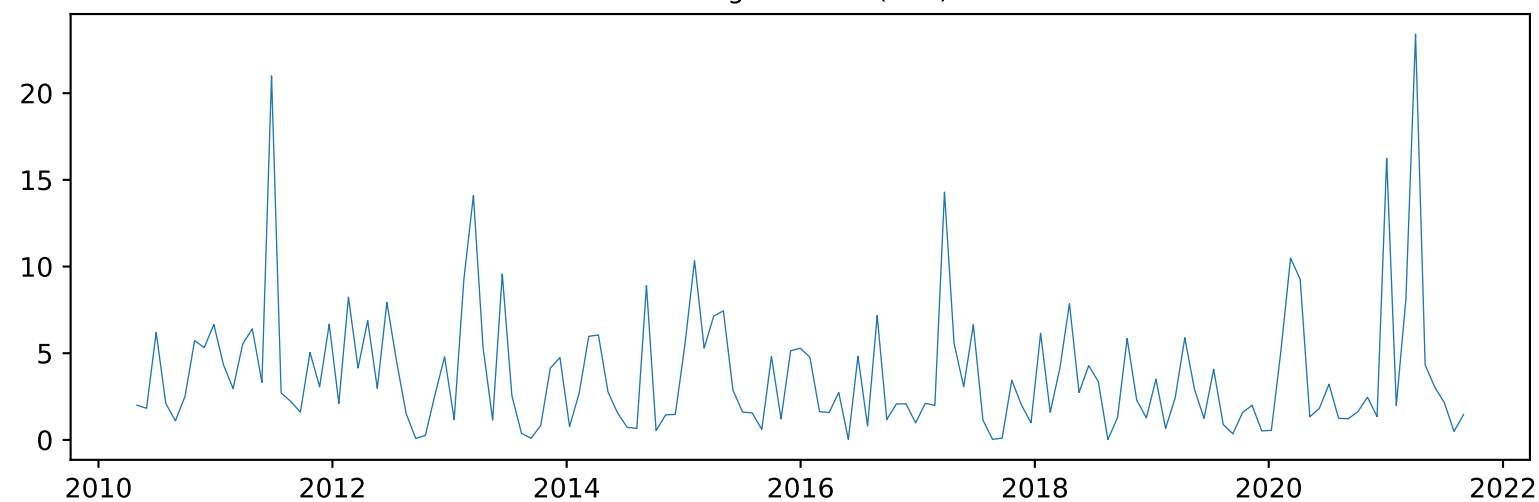
Quality Code: B, Number: 645, Percentage: 15.46%

Quality Code: C, Number: 92, Percentage: 2.21%

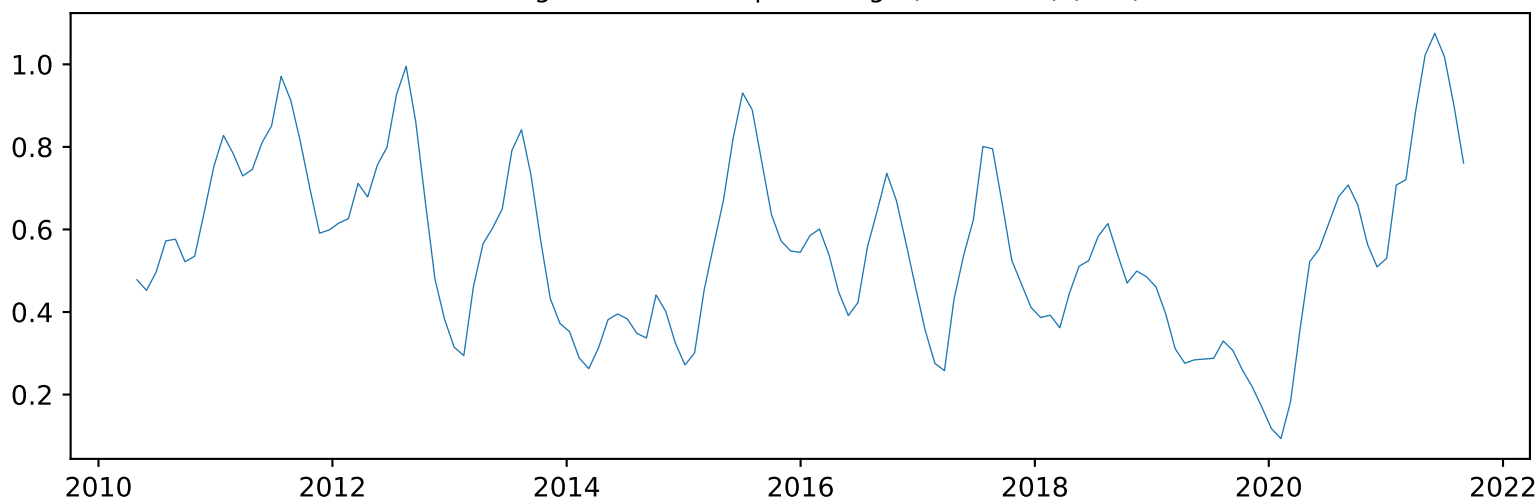
Average Standing Water Level (m)



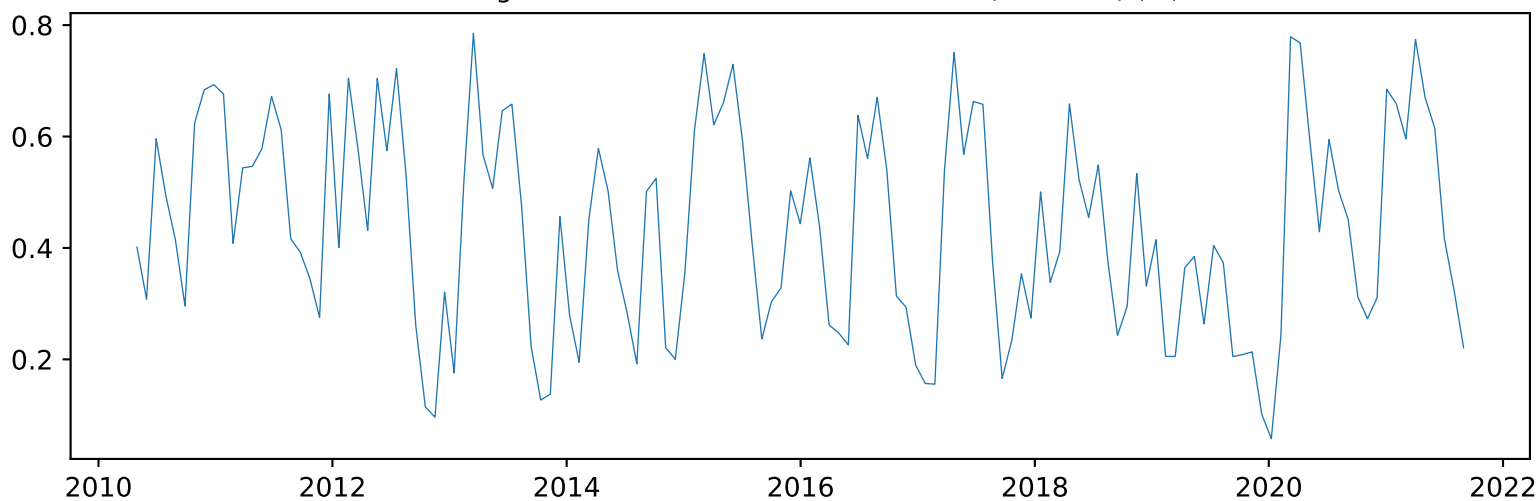
Average Rainfall (mm)



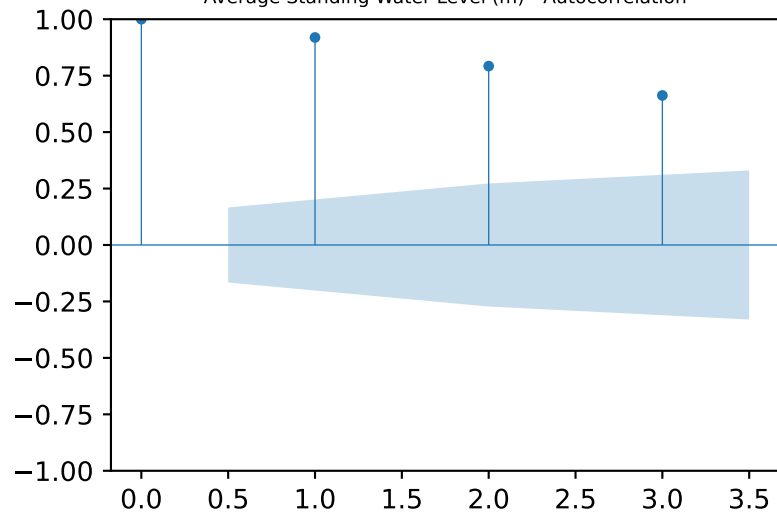
Average Absolute Deep Drainage (below 6m) (mm)



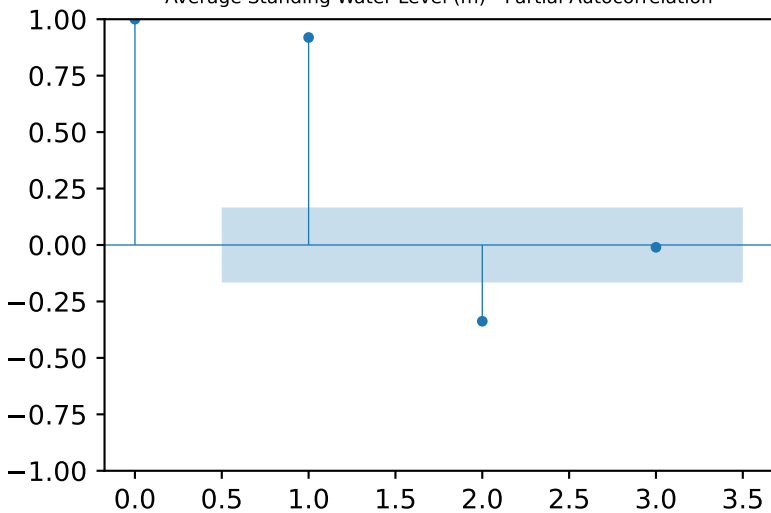
Average Absolute Root Zone Soil Moisture (0-100cm) (%)



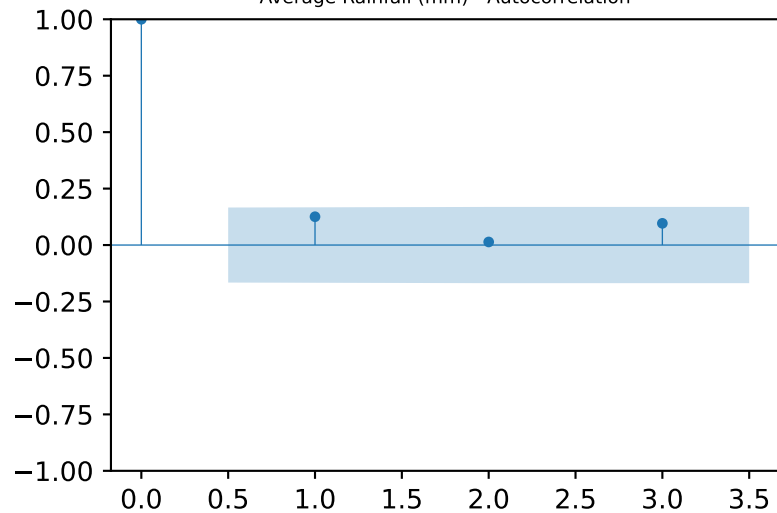
Average Standing Water Level (m) - Autocorrelation



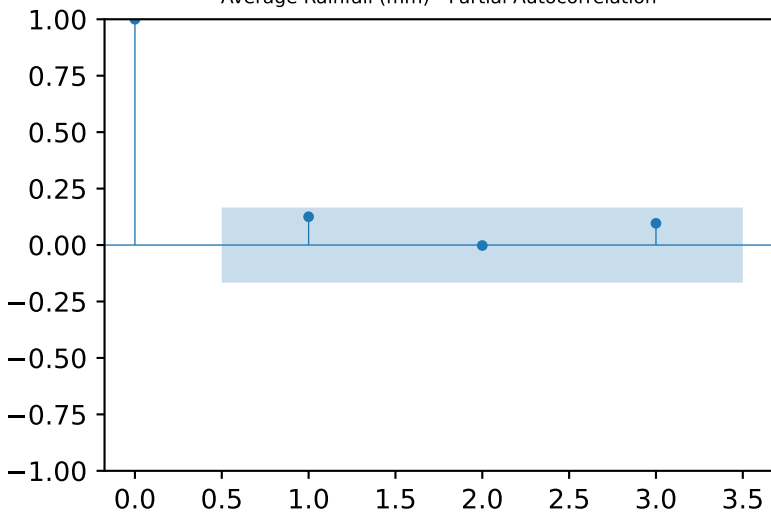
Average Standing Water Level (m) - Partial Autocorrelation



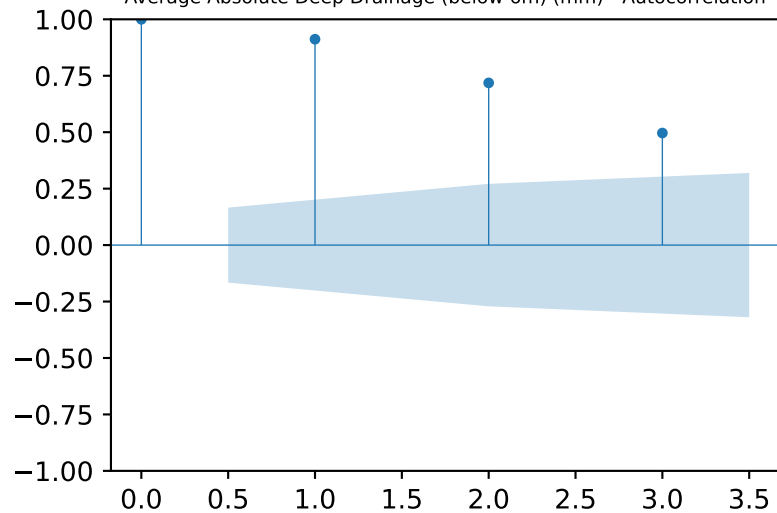
Average Rainfall (mm) - Autocorrelation



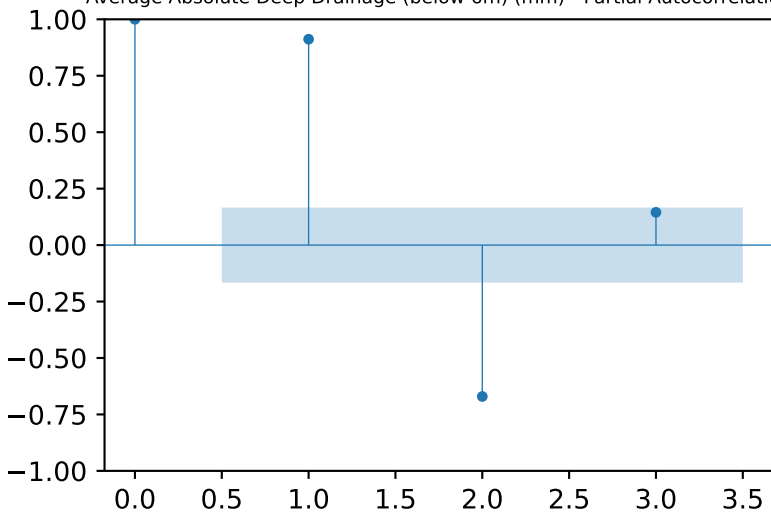
Average Rainfall (mm) - Partial Autocorrelation



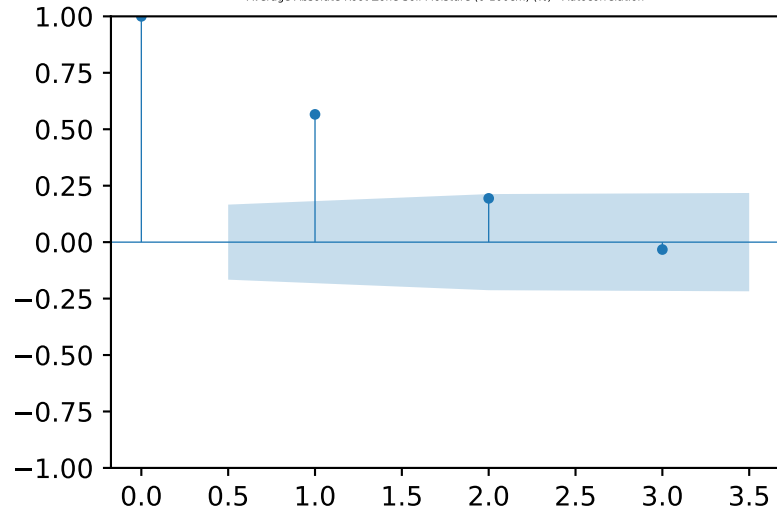
Average Absolute Deep Drainage (below 6m) (mm) - Autocorrelation



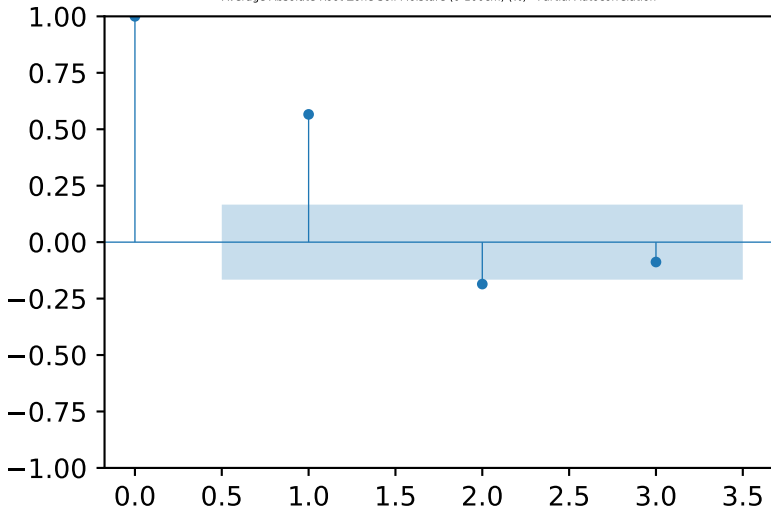
Average Absolute Deep Drainage (below 6m) (mm) - Partial Autocorrelation



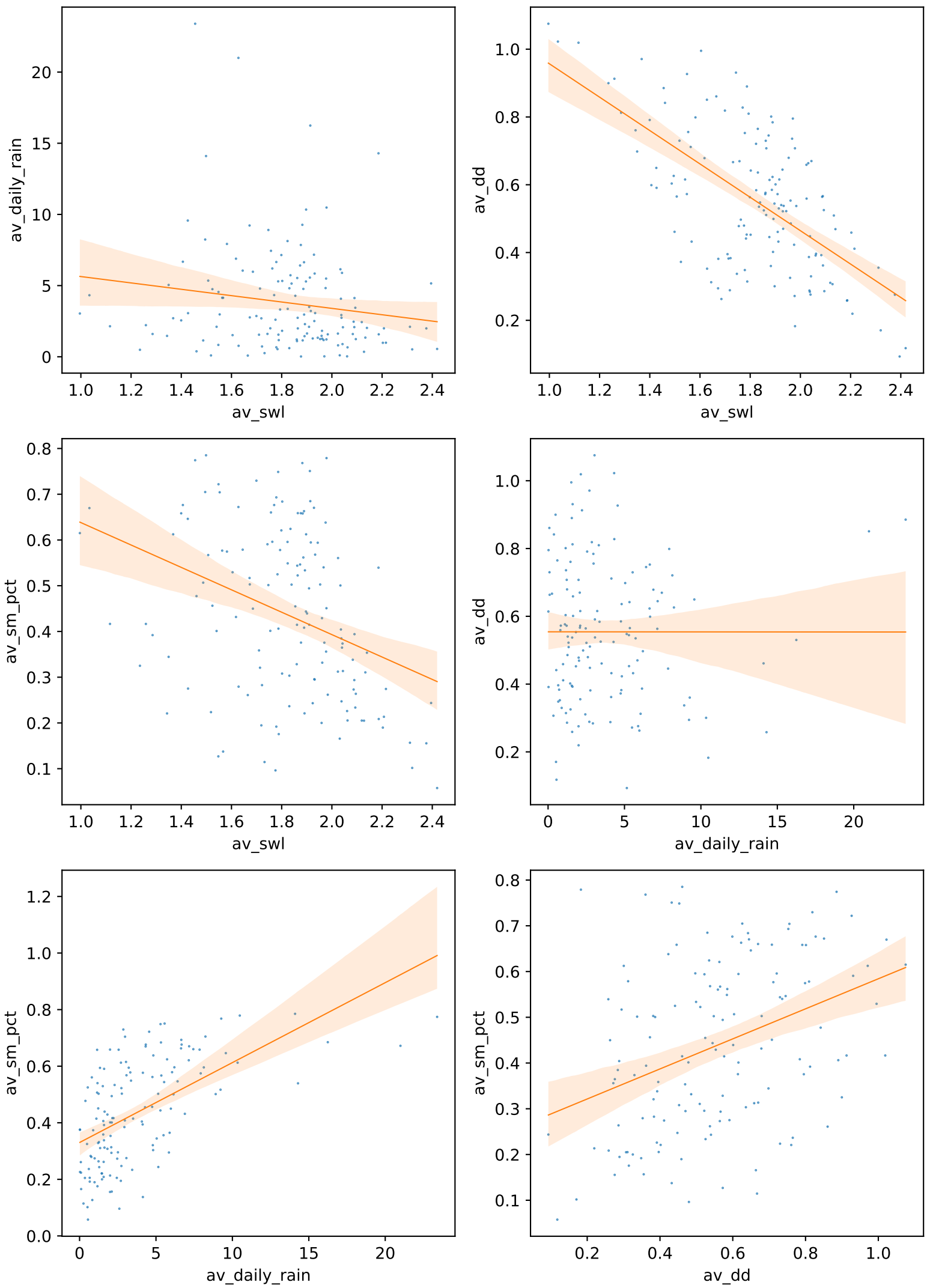
Average Absolute Root Zone Soil Moisture (0-100cm) (%) - Autocorrelation



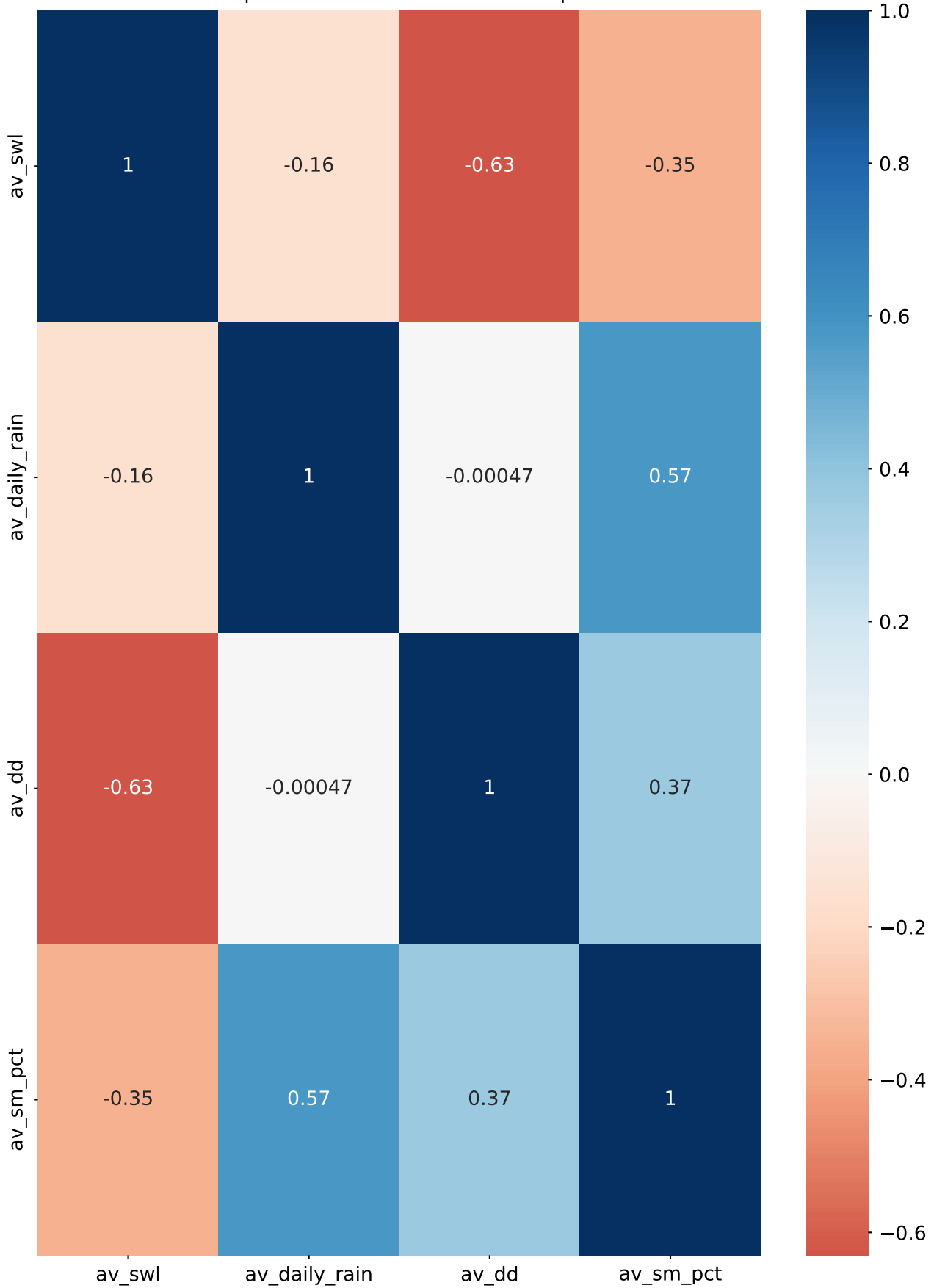
Average Absolute Root Zone Soil Moisture (0-100cm) (%) - Partial Autocorrelation



Input Variable Correlation



Input Variable Correlation Heatmap



<><> TensorFlow Keras LSTM Model <><>

Optimiser: adam
Loss: mse
Number of Epochs: 100
Percentage of Training Data for Validation: 20.0%
Time Series Order: Chronological
Verbose: Off

<><> Model Architecture <><>

Input Shape (Samples, Timesteps, Features): (108, 3, 4)
LSTM Layers: 1
LSTM Cells per Layer: 64
Fully Connected Hidden Layers: 2
Fully Connected Hidden Neurons per Layer: 32
Fully Connected Output Neurons: 1
LSTM Dropout Rate: 20.0%
LSTM Recurrent Dropout Rate: 20.0%

Model: "sequential_47"

Layer (type)	Output Shape	Param #
=====		
lstm_47 (LSTM)	(None, 64)	17664
dense_141 (Dense)	(None, 32)	2080
dense_142 (Dense)	(None, 32)	1056
dense_143 (Dense)	(None, 1)	33
=====		
Total params: 20,833		
Trainable params: 20,833		
Non-trainable params: 0		

<><> Training Loss <><>

Epoch: 10, Loss: 0.047081008553504944
Epoch: 20, Loss: 0.023086614906787872
Epoch: 30, Loss: 0.01801382750272751
Epoch: 40, Loss: 0.013766016811132431
Epoch: 50, Loss: 0.01749378815293312
Epoch: 60, Loss: 0.016099298372864723
Epoch: 70, Loss: 0.008890017867088318
Epoch: 80, Loss: 0.012793447822332382
Epoch: 90, Loss: 0.010137008503079414
Epoch: 100, Loss: 0.01152733899652958

<><> Validation Loss <><>

Epoch: 10, Loss: 0.022129695862531662
Epoch: 20, Loss: 0.017724184319376945
Epoch: 30, Loss: 0.011460081674158573
Epoch: 40, Loss: 0.005528926383703947
Epoch: 50, Loss: 0.007132906001061201
Epoch: 60, Loss: 0.006709450390189886
Epoch: 70, Loss: 0.006370970979332924
Epoch: 80, Loss: 0.007060021162033081
Epoch: 90, Loss: 0.004727091174572706
Epoch: 100, Loss: 0.0053124502301216125

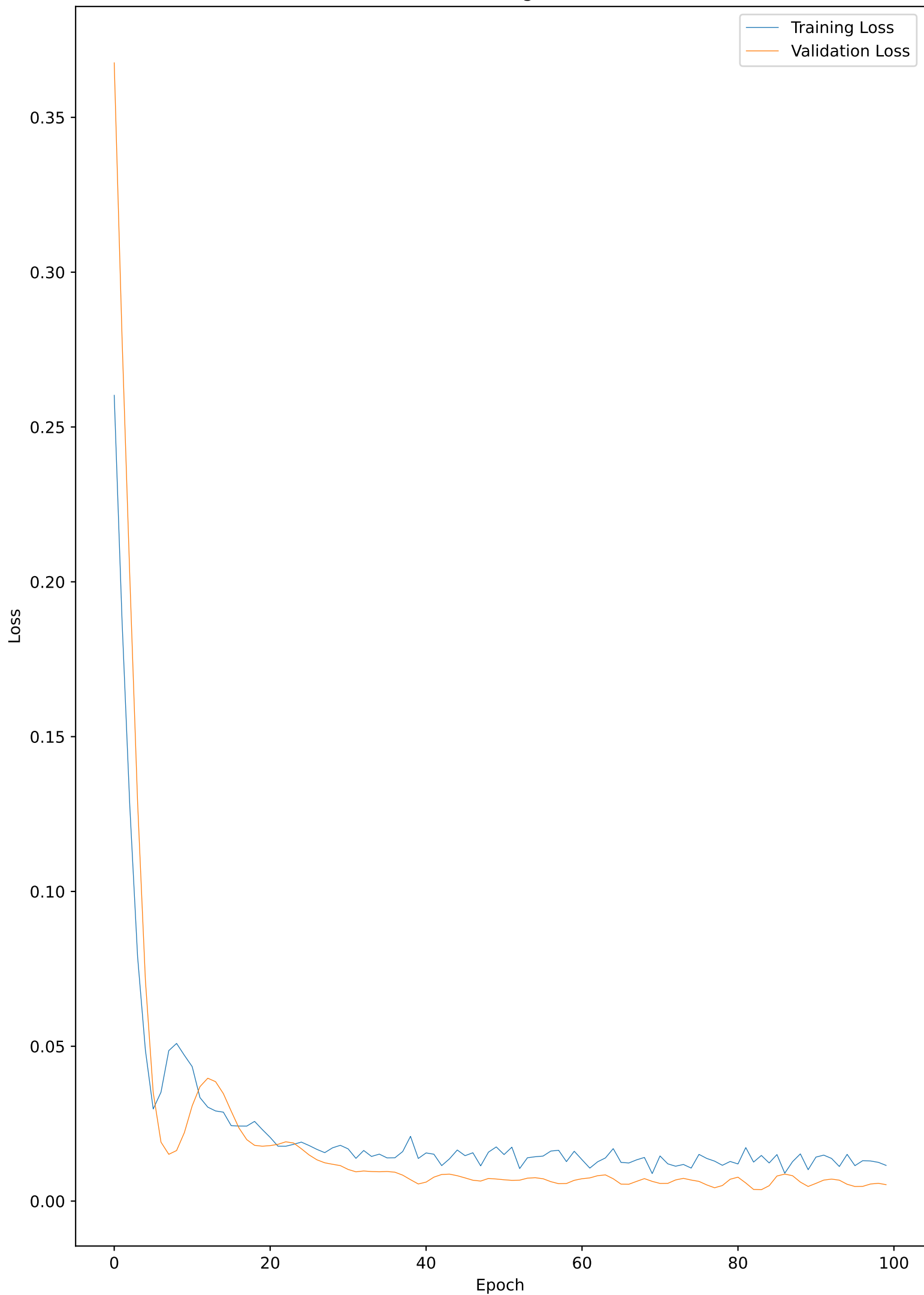
<><> Training Set Scores <><>

Train Root Mean Squared Error: 0.07977
Train Mean Squared Error: 0.00636
Train Normalised Root Mean Squared Error: 0.10162
Train Coefficient of Determination: 0.74493
Train Normalised Nash Sutcliffe Efficiency: 0.79677
Train Mean Absolute Error: 0.06281
Train Pearson's Correlation Coefficient: 0.92468
Train Index of Agreement: 0.89645
Train Kling-Gupta Efficiency: 0.58614
Train Mean Bias Error: -0.00189
Train Mean Absolute Percentage Error: 0.05112

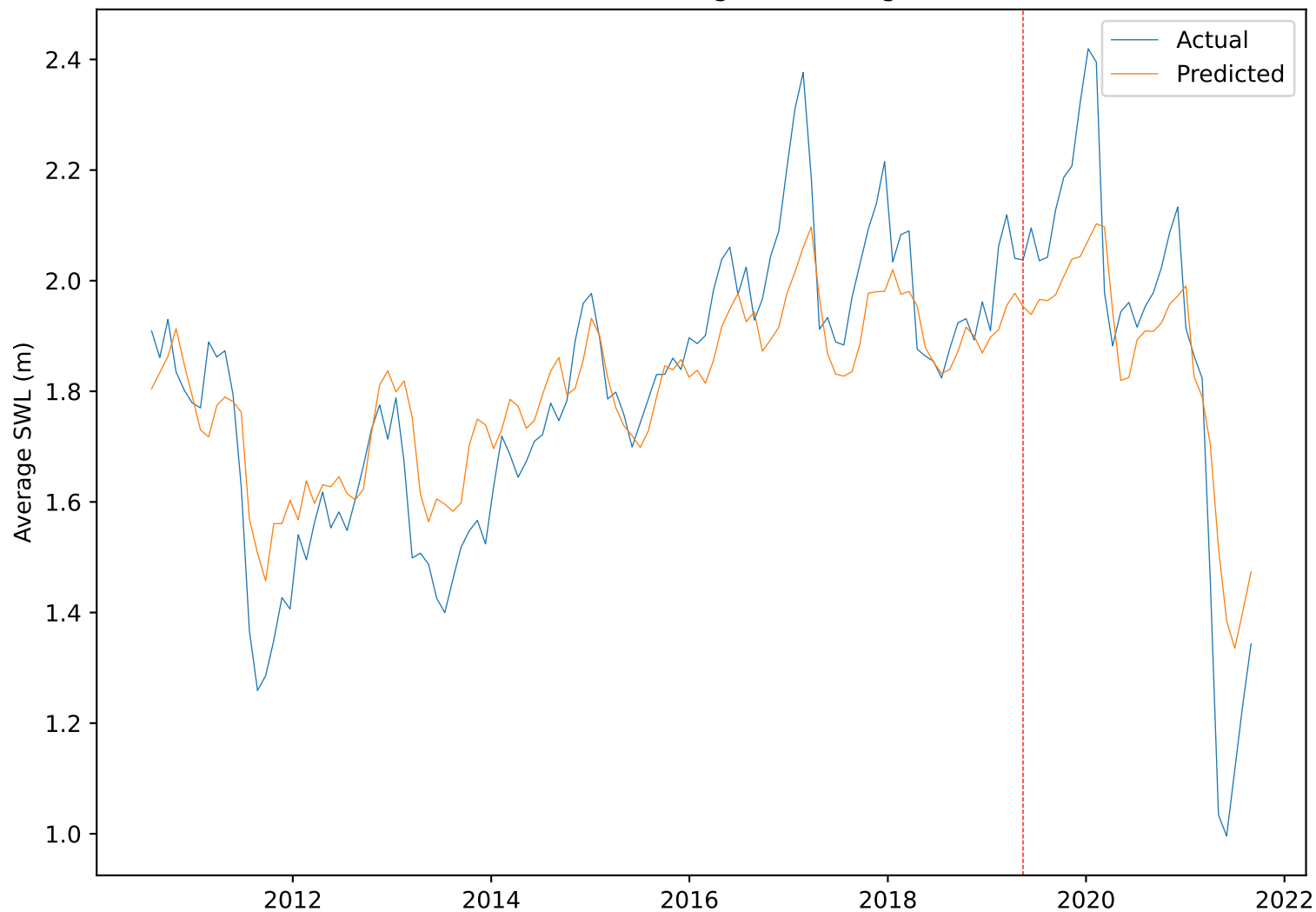
<><> Test Set Scores <><>

Test Root Mean Squared Error: 0.13679
Test Mean Squared Error: 0.01871
Test Normalised Root Mean Squared Error: 0.13679
Test Coefficient of Determination: 0.74982
Test Normalised Nash Sutcliffe Efficiency: 0.79988
Test Mean Absolute Error: 0.11228
Test Pearson's Correlation Coefficient: 0.94982
Test Index of Agreement: 0.89588
Test Kling-Gupta Efficiency: 0.56083
Test Mean Bias Error: -0.01717
Test Mean Absolute Percentage Error: 0.09933

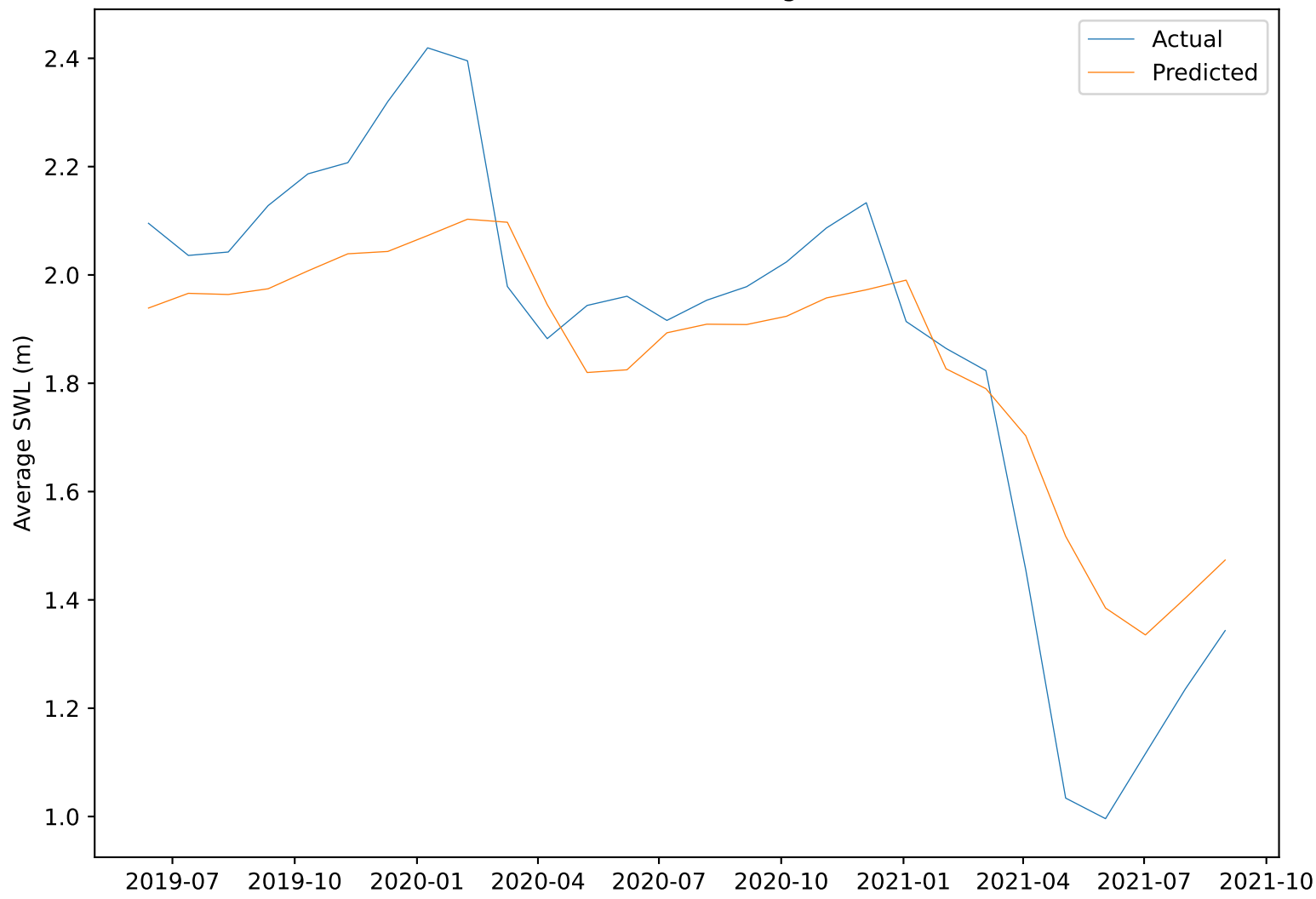
LSTM Learning Curves



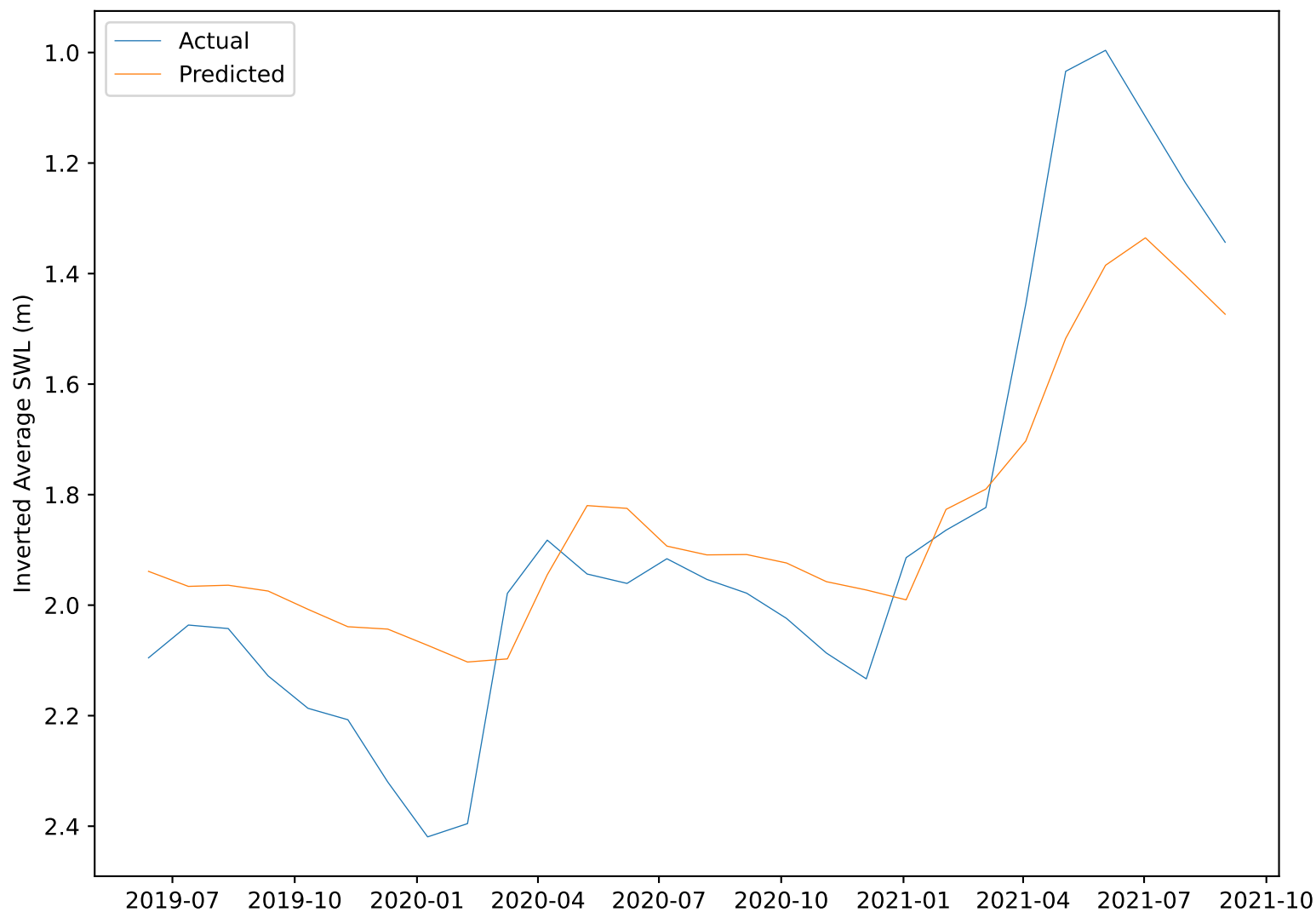
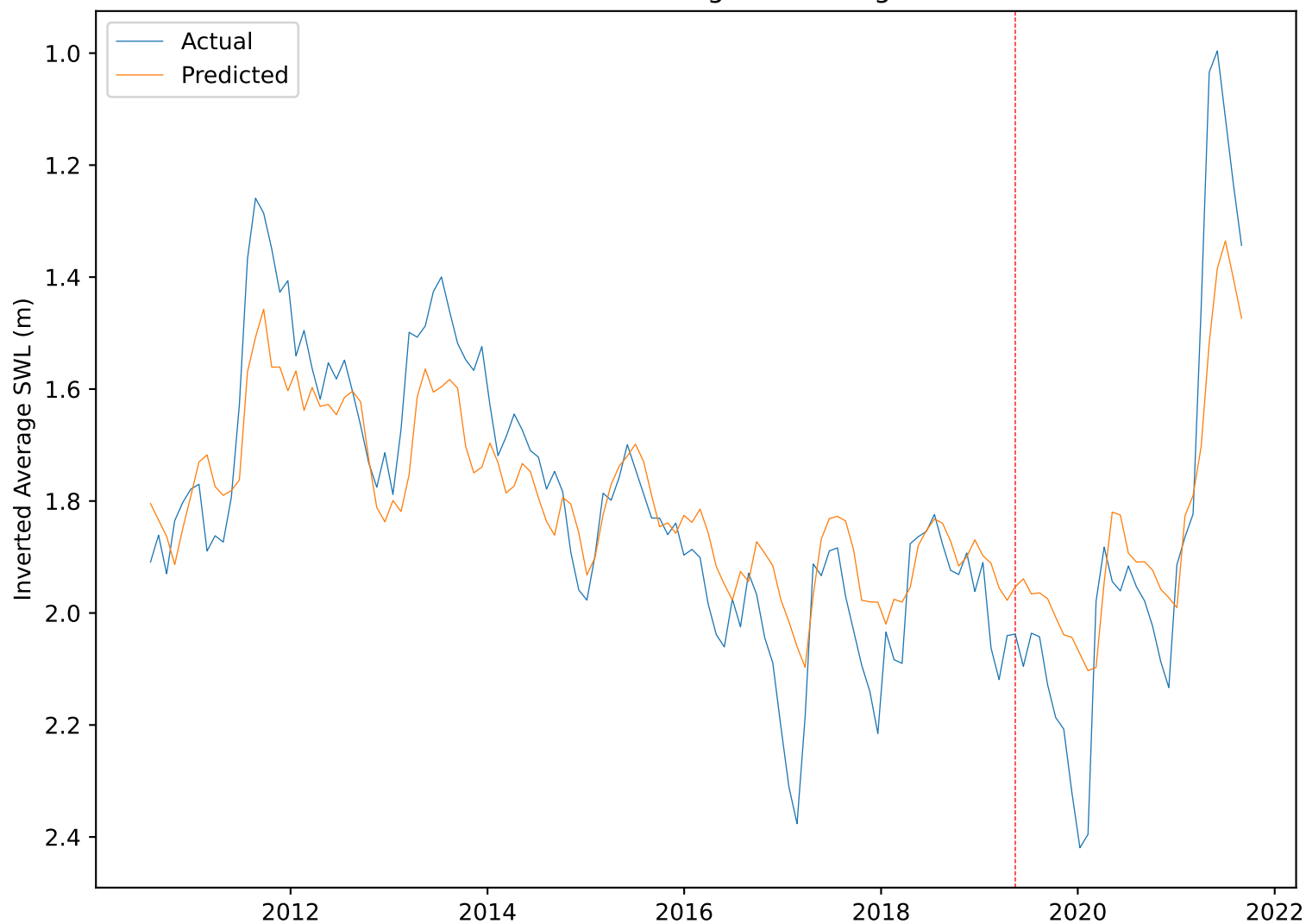
LSTM Model: Training and Testing Sets



LSTM Model: Testing Set



LSTM Model: Training and Testing Sets



<><> Scikit Learn SVR Model <><>

Kernel Function: rbf
Kernel Coefficient: scale
Epsilon: 0.1
Stopping Criterion Tolerance: 1e-05
Regularisation Parameter: 1.0
Shrinking: True
Time Series Order: Chronological
Verbose: Off

<><> Model Architecture <><>

Number of Support Vectors: 20
Input/Support Vector Size: 12

<><> 5-Fold Cross Validation Mean Training Loss <><>

Epoch: 8, Loss: 0.0019374427545810011
Epoch: 16, Loss: 0.00658206100054521
Epoch: 24, Loss: 0.005878276236353975
Epoch: 32, Loss: 0.0053705562940711115
Epoch: 40, Loss: 0.005025177619068231
Epoch: 48, Loss: 0.004763305960099366
Epoch: 56, Loss: 0.004267592007814004
Epoch: 64, Loss: 0.004320165174492026
Epoch: 72, Loss: 0.0043240064164985995
Epoch: 80, Loss: 0.004055122782769806

<><> 5-Fold Cross Validation Mean Validation Loss <><>

Epoch: 8, Loss: 0.02183136536234781
Epoch: 16, Loss: 0.03278169737716904
Epoch: 24, Loss: 0.03314699926910146
Epoch: 32, Loss: 0.028628936585510485
Epoch: 40, Loss: 0.02644091323330467
Epoch: 48, Loss: 0.02561856809187283
Epoch: 56, Loss: 0.017910745025780616
Epoch: 64, Loss: 0.018026115889585415
Epoch: 72, Loss: 0.01151435651717271
Epoch: 80, Loss: 0.008860935177434285

<><> Training Set Scores <><>

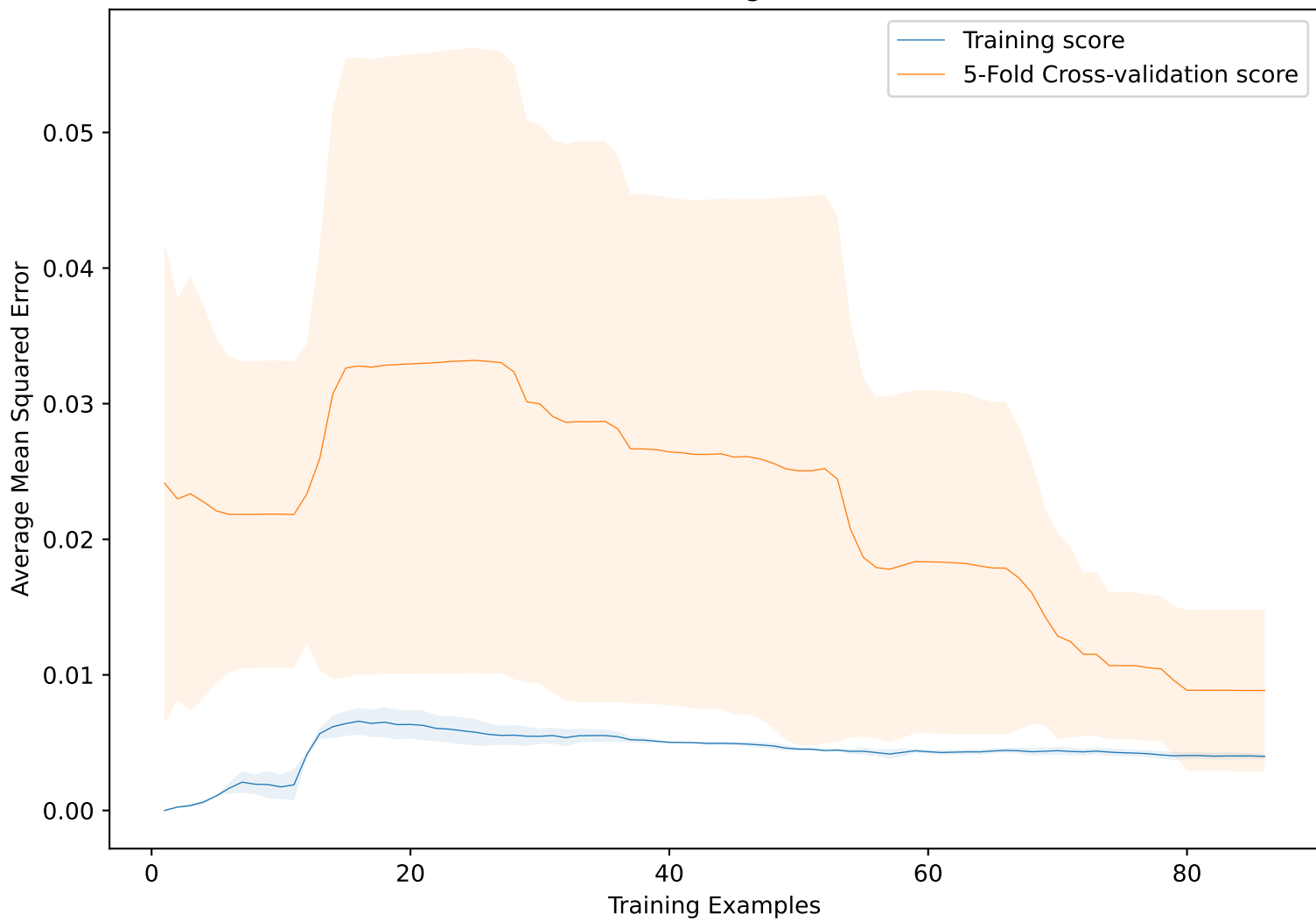
Train Root Mean Squared Error: 0.06136
Train Mean Squared Error: 0.00377
Train Normalised Root Mean Squared Error: 0.07817
Train Coefficient of Determination: 0.84906
Train Normalised Nash Sutcliffe Efficiency: 0.86886

Train Mean Absolute Error: 0.05042
Train Pearson's Correlation Coefficient: 0.93395
Train Index of Agreement: 0.95126
Train Kling-Gupta Efficiency: 0.774
Train Mean Bias Error: -0.0042
Train Mean Absolute Percentage Error: 0.04072

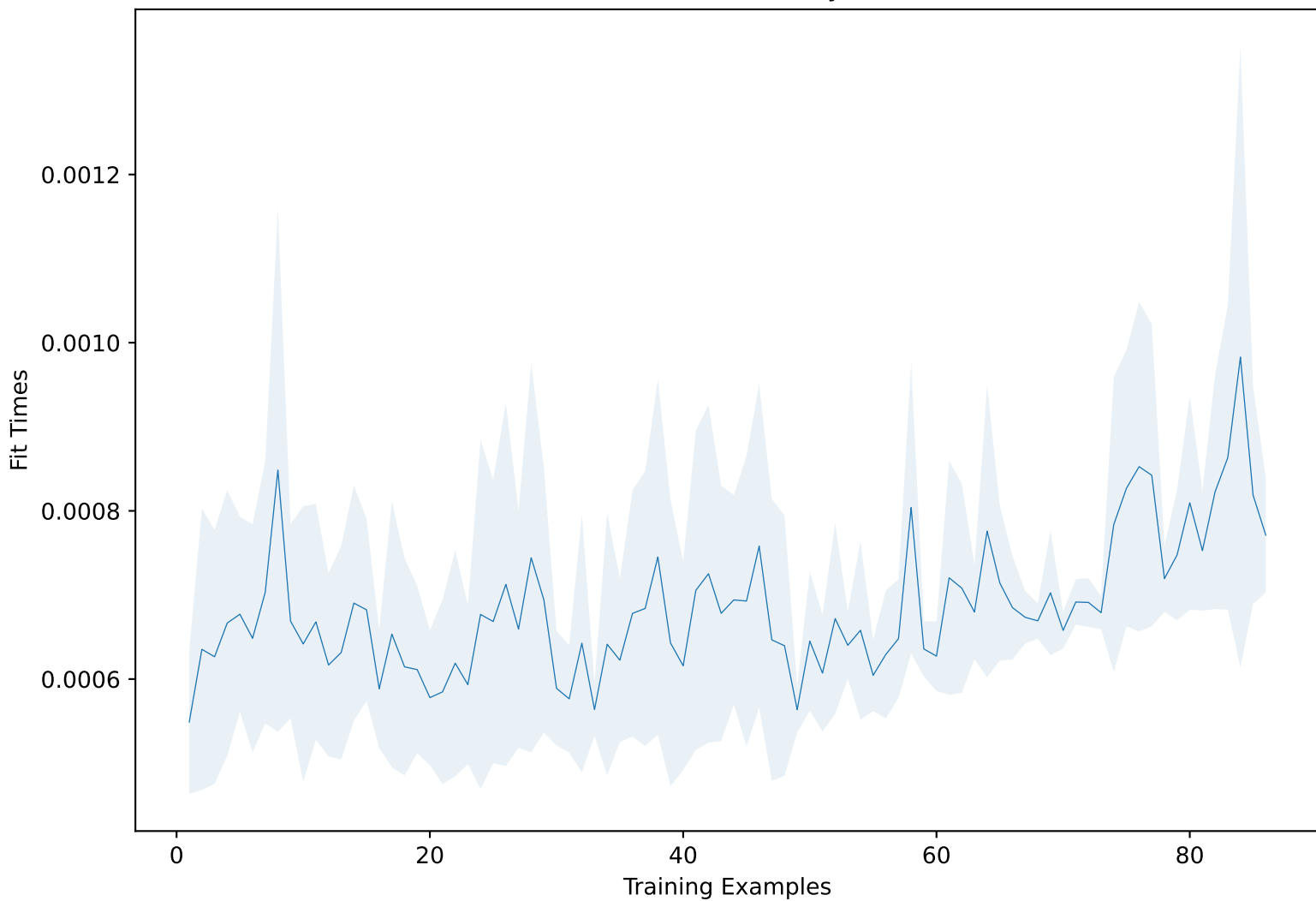
<><> Test Set Scores <><>

Test Root Mean Squared Error: 0.15213
Test Mean Squared Error: 0.02314
Test Normalised Root Mean Squared Error: 0.15213
Test Coefficient of Determination: 0.69054
Test Normalised Nash Sutcliffe Efficiency: 0.76368
Test Mean Absolute Error: 0.12396
Test Pearson's Correlation Coefficient: 0.91134
Test Index of Agreement: 0.86559
Test Kling-Gupta Efficiency: 0.53208
Test Mean Bias Error: -0.01495
Test Mean Absolute Percentage Error: 0.11234

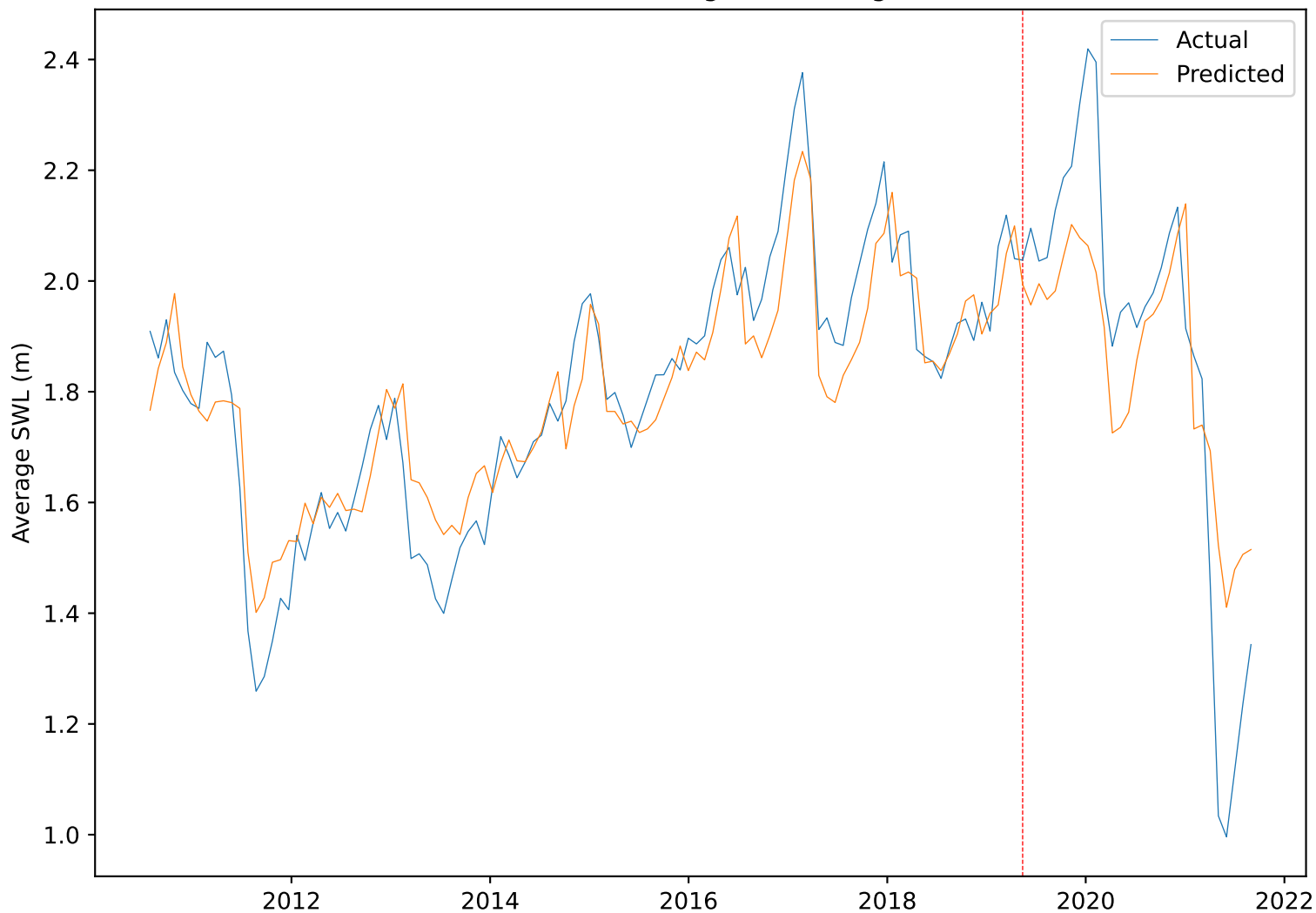
SVR Learning Curve



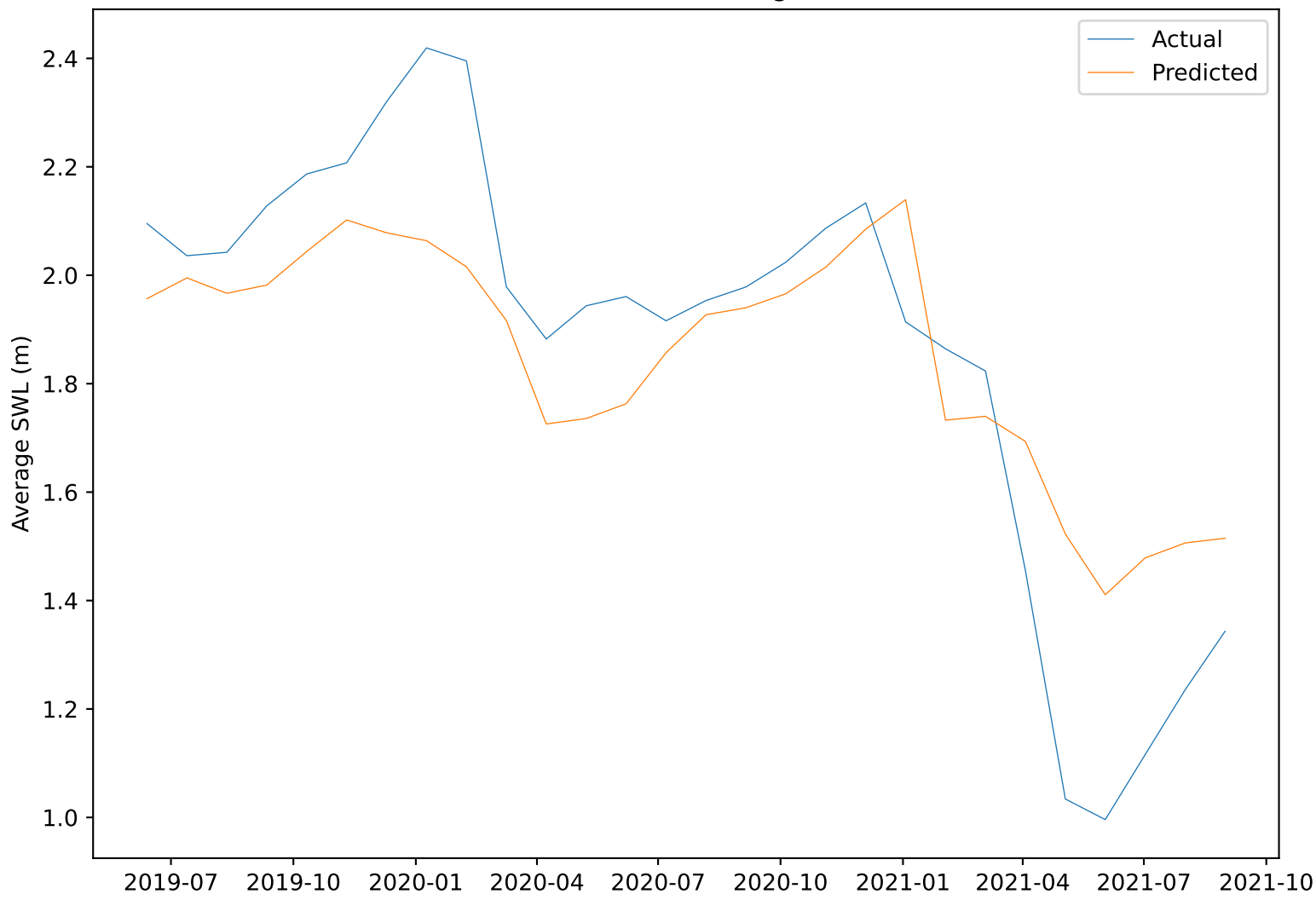
Model Scalability



SVR Model: Training and Testing Sets



SVR Model: Testing Set



SVR Model: Training and Testing Sets

