



Vortex

VTX Air

Southwark Deployment

Air Quality Monitoring Report Jul-Sep



Southwark Deployment – July to September Review



A deployment of 6 Vortex Air Quality sensors were installed in Southwark for a comparison study.

The devices are capable of measuring NO₂, Ozone (O₃) and Particulate Matter (PM2.5 and PM10). This document will review the performance of the gas sensors against the nearest reference stations.

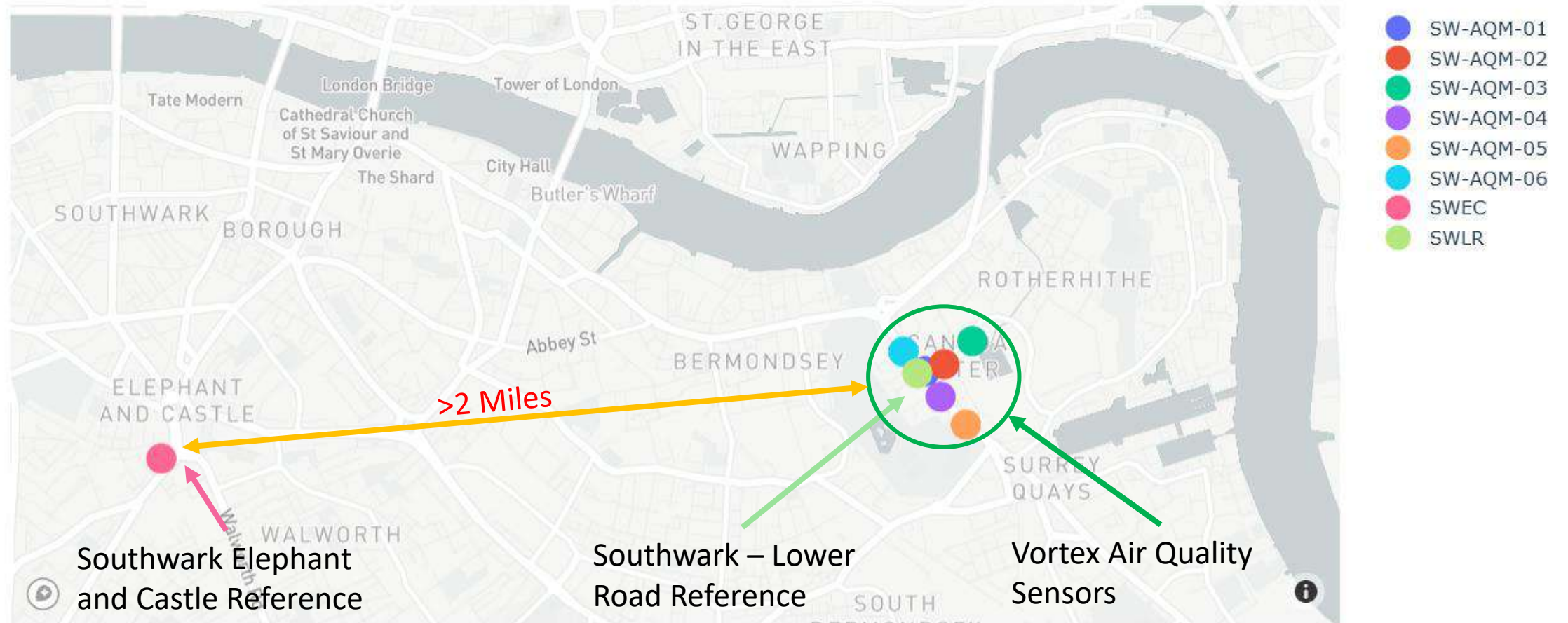
Southwark Lower Road: NO₂, PM2.5, PM10

Elephant and Castle: NO₂, O₃, PM2.5 and PM10

The Elephant and Castle reference station is a little over 2 miles away from the deployment and as such the data would should be considered as a lower bound to the accuracy of the sensors.



Southwark Deployment – July to September Review



6 Vortex Air Quality Sensors were installed in proximity to the Southwark Lower Road reference station.

The Elephant and Castle reference station is the nearest reference monitoring Ozone.

Southwark Deployment – July to September Review



Vortex Calibration Procedure:

The Vortex gas sensor data is calibrated by an AI model which takes into account an initial calibration method for the sensors as well as the data from a burn in period where the device's outputs are compared against a co-located reference station.

The sensors are retrained periodically to ensure the data remains within the specified range. In this case the Southwark Lower Road reference was used to train the devices NO_2 and Southwark Elephant and Castle was used to train O_3 .



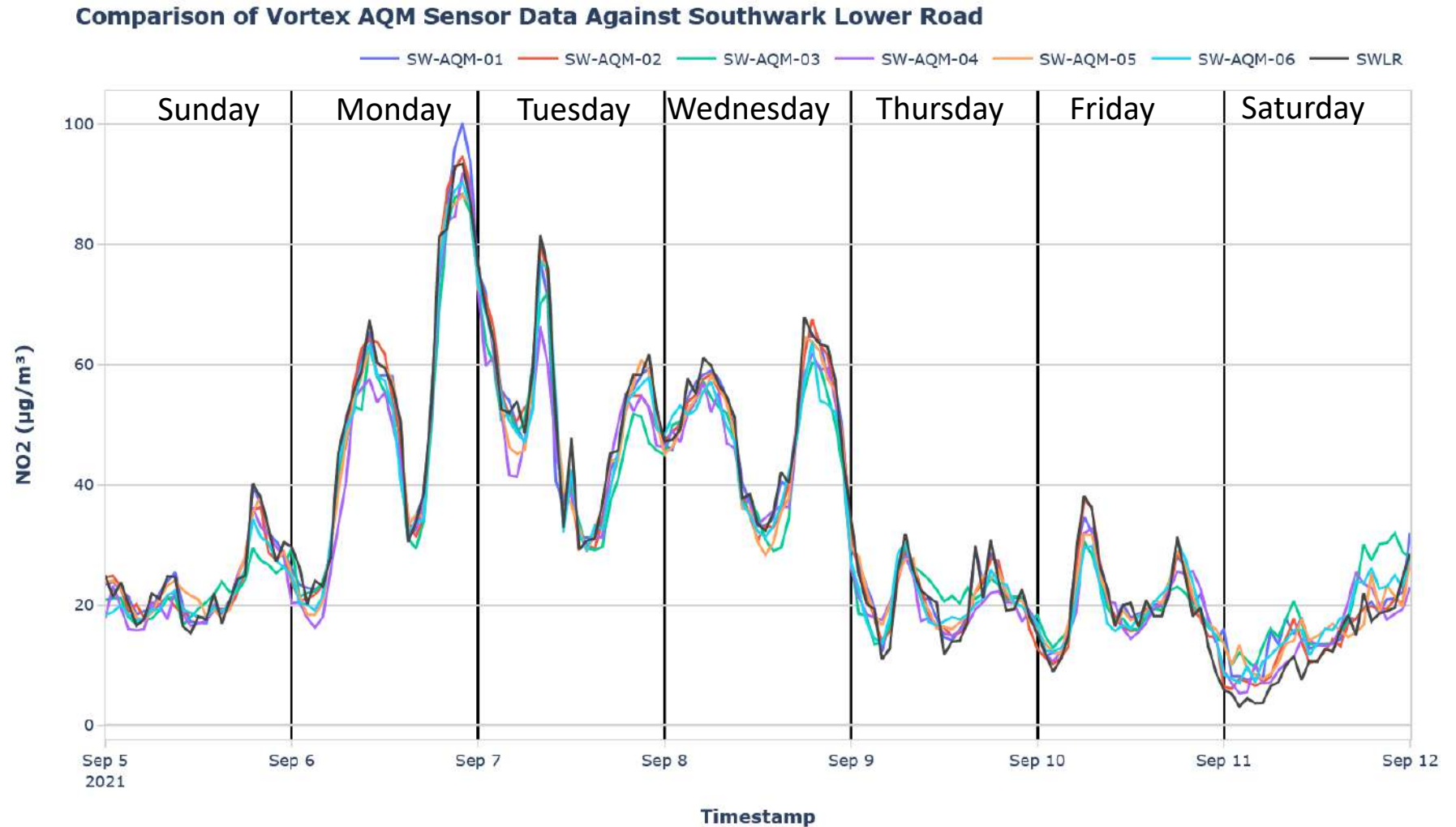
Southwark Deployment – NO₂ Data



A week long period at the start of September is shown here as it showed a wide range of variability of data.

The 6 Vortex sensors are in good agreement with each other and the Southwark Lower Road (SWLR) reference shown in black.

The sensors report accurately across the range of data levels observed between 0 and 100µg/m³

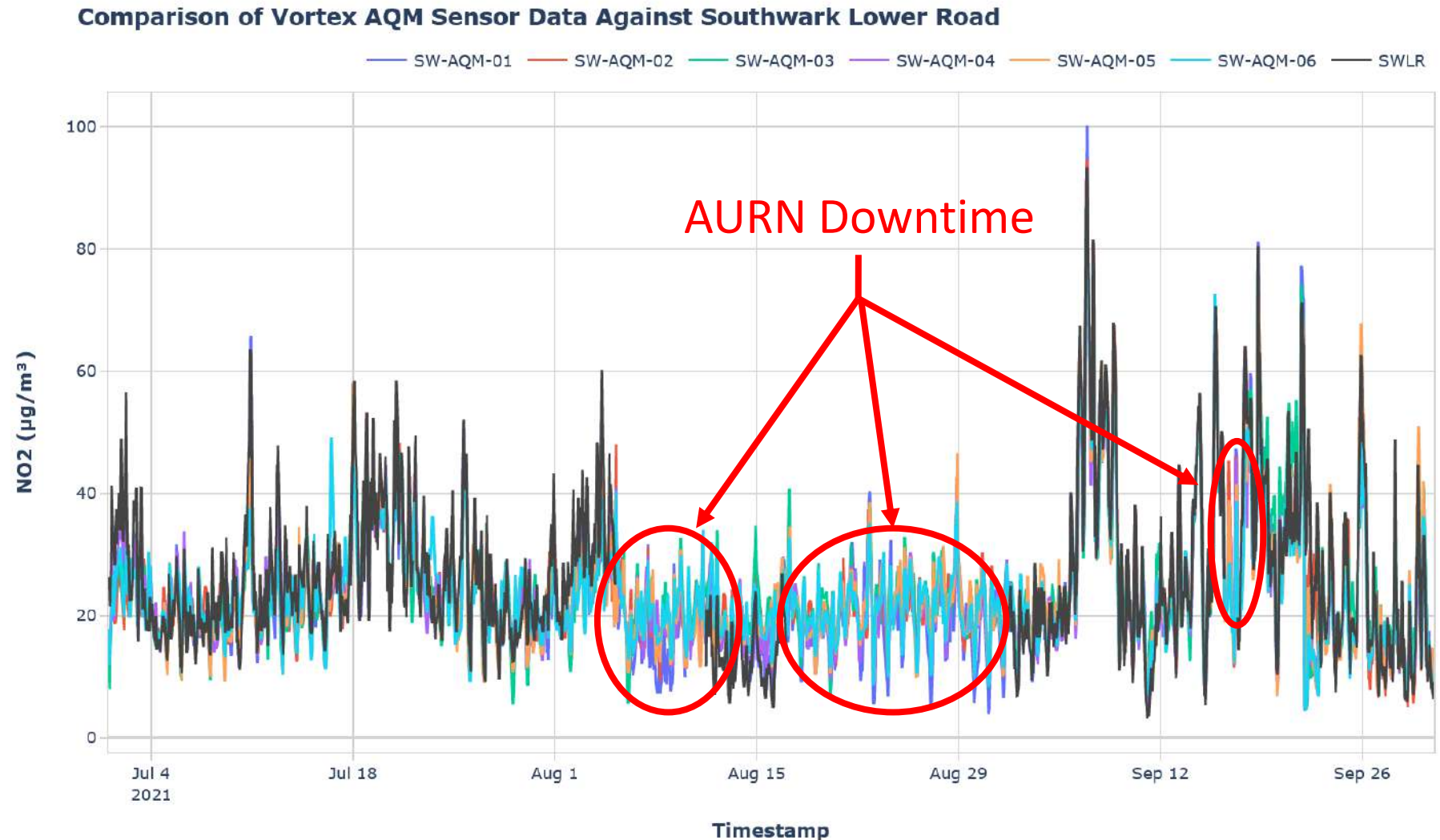


Southwark Deployment – NO₂ Data



Over the 3 Month period of the study there were two significant data outages of the Southwark Lower Road reference station in August as well as a shorter one in September.

The Vortex sensors track the reference station well over the full period, even in early September where the levels reach their highest.

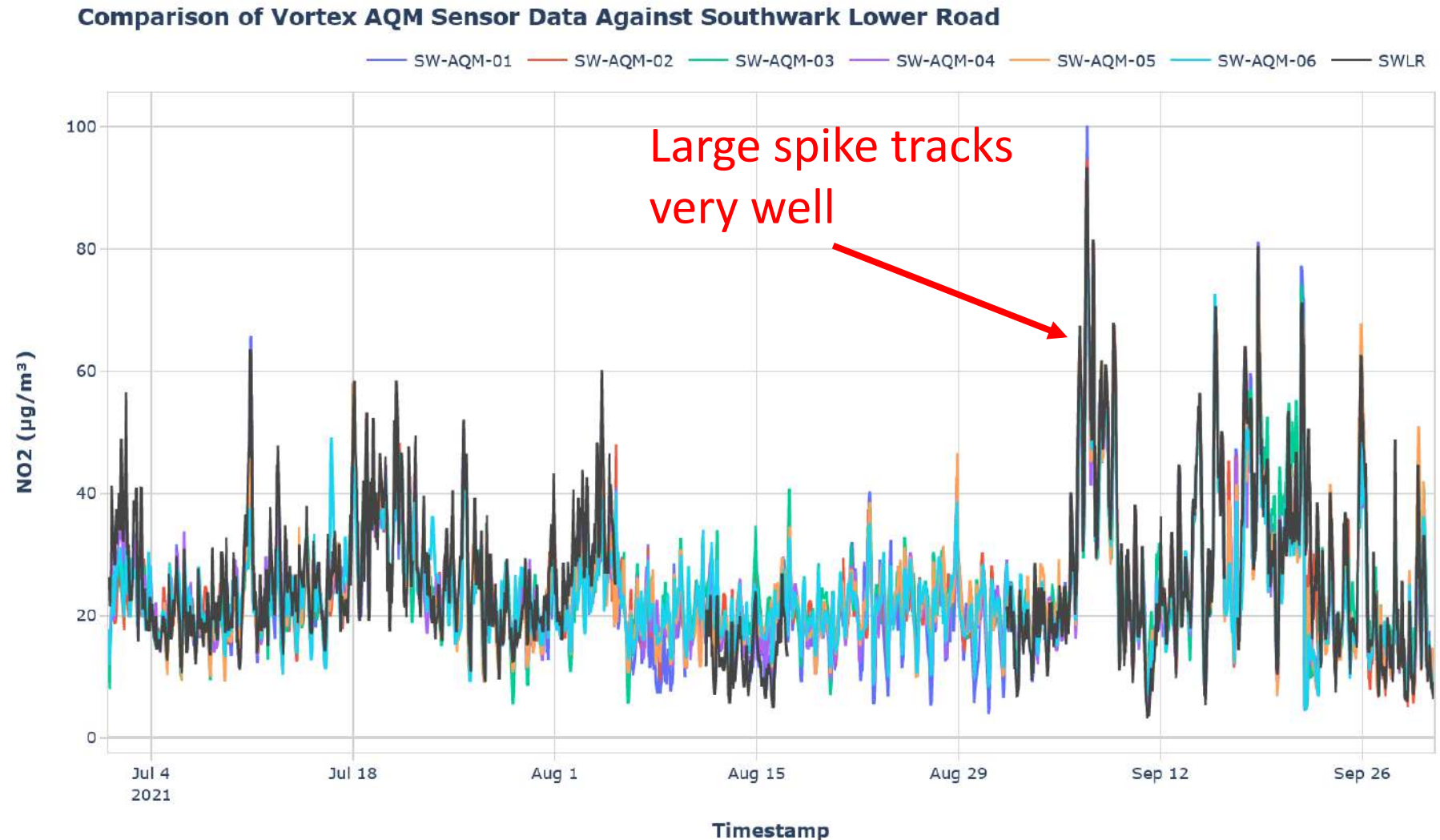


Southwark Deployment – NO₂ Data



The period in September of relatively high levels is matched well and contributes to a strong R² value.

Since Lower Road and Elephant and Castle reference stations have good correlation, the Elephant and Castle reference was used to confirm the Vortex measurements during Lower Road outages.

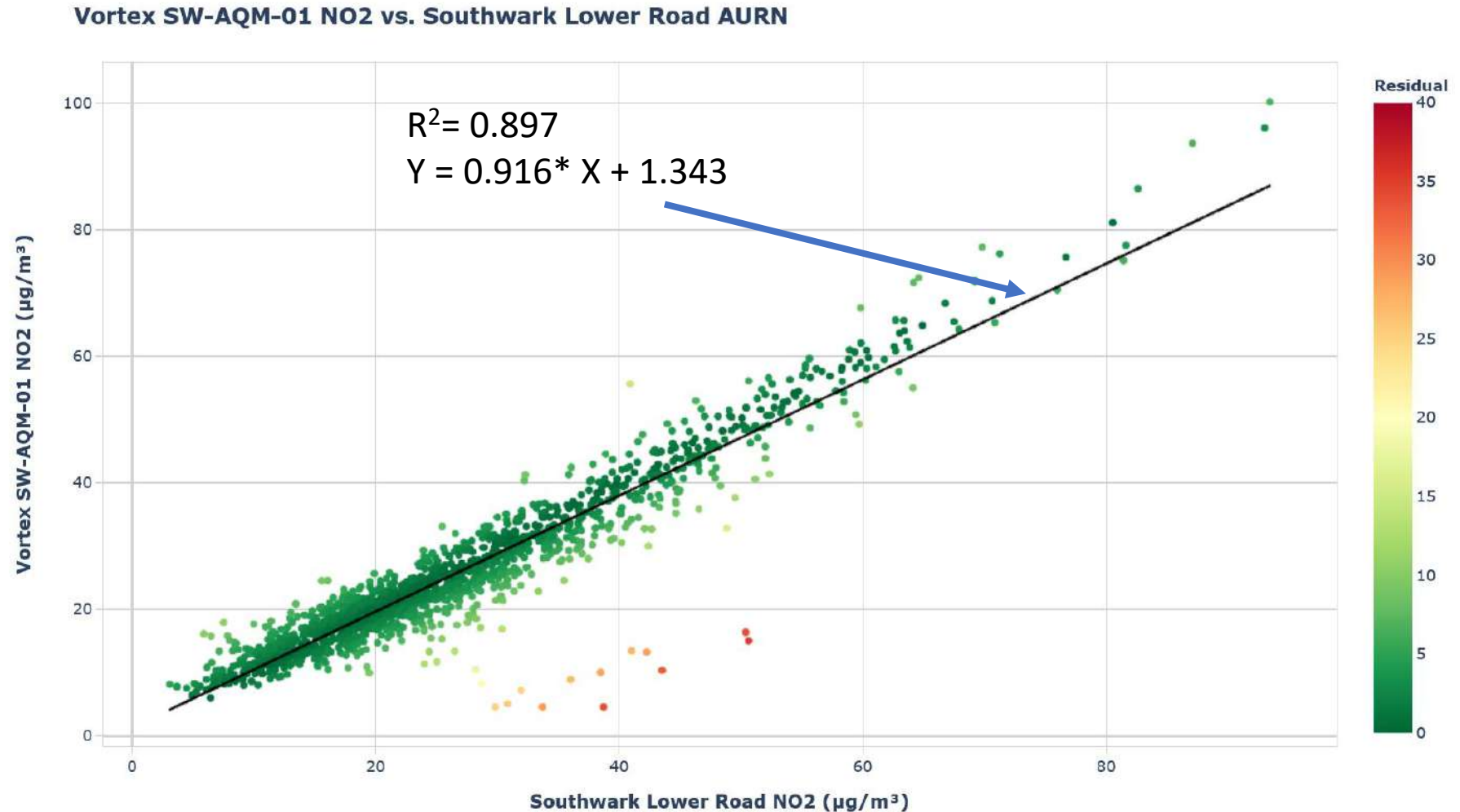


Southwark Deployment – NO₂ Data



The sensor nearest to the reference station was selected for clarity and the hourly average of the Vortex station was compared to the hourly reference station measurement.

The majority of the data seen occurs below 40 $\mu\text{g}/\text{m}^3$ however the sensors are in good agreement across the full range.

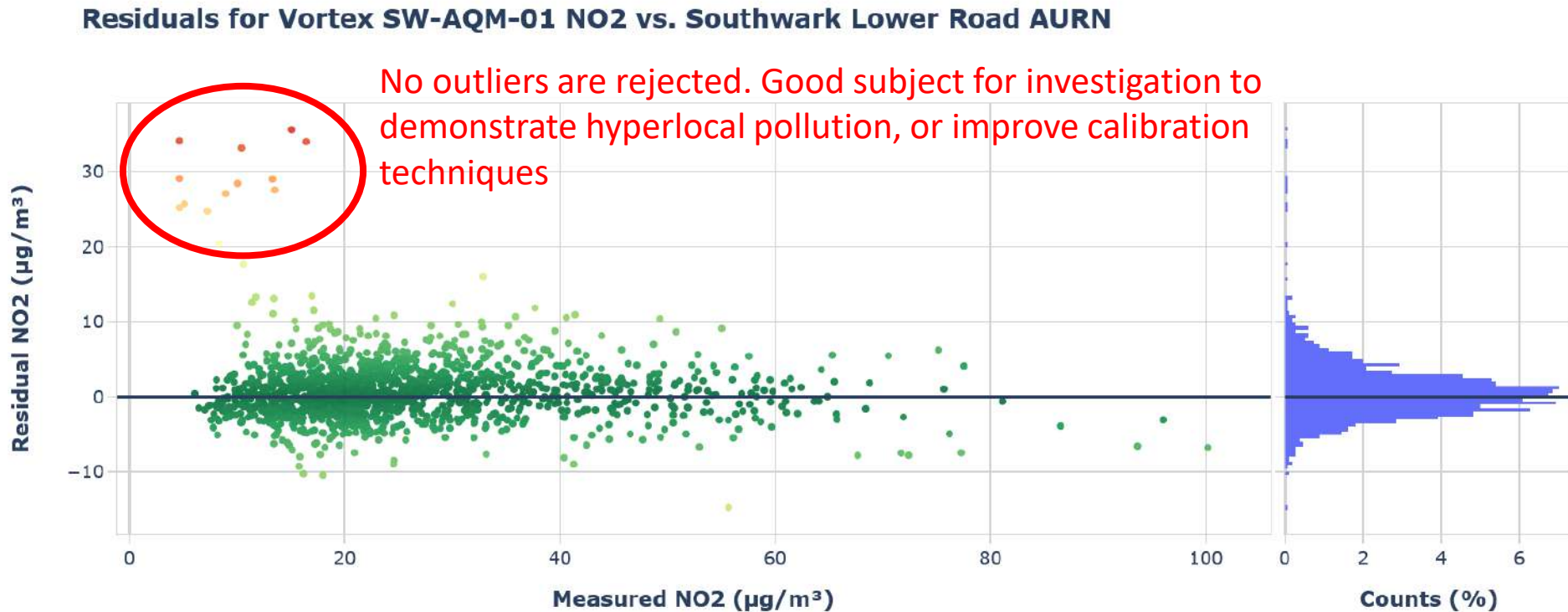


Southwark Deployment – NO₂ Data



The sensors are in good agreement across the full range of data with the distribution of the residuals remaining consistent across a range of measured values.

This study includes all data for which the reference station was operational and no outliers have been removed.



Southwark Deployment – O₃ Data

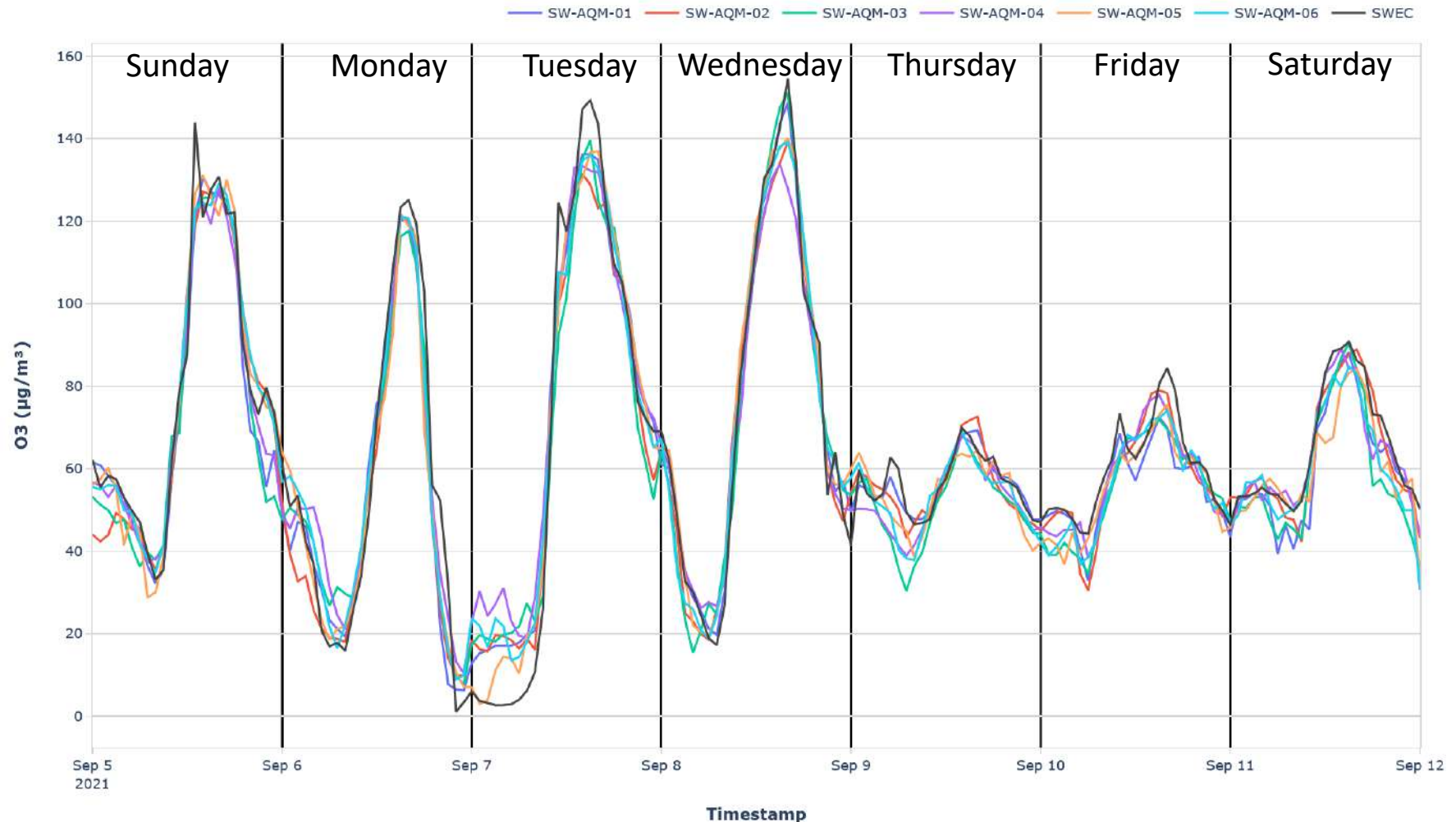


A week long period at the start of September is shown here as it showed a wide range of variability of data.

The 6 Vortex sensors are in reasonable agreement with each other and the Southwark Elephant and Castle (SWEC) reference shown in black.

The sensors report accurately across the range of data levels observed between 0 and 150 $\mu\text{g}/\text{m}^3$

Comparison of Vortex AQM Sensor Data Against Southwark Elephant and Castle

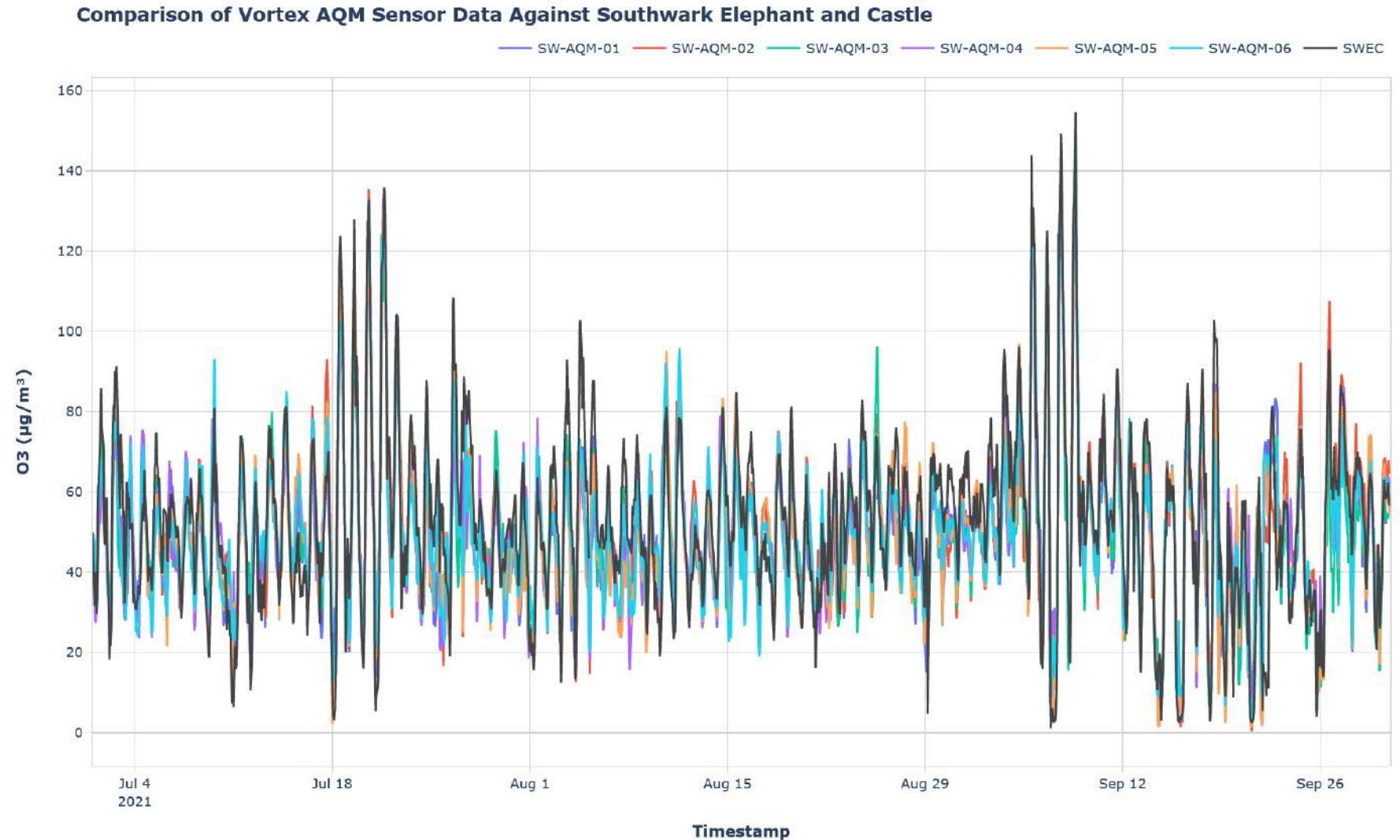


Southwark Deployment – O₃ Data



Over the 3 Month period of the study there no outages on the Elephant and Castle reference station, however SW-AQM-01 experienced 2 short outages where a minor amount of data was lost.

Despite the distance between them the Vortex sensors track the reference station well over the full period, even in early September where the levels fluctuate significantly.

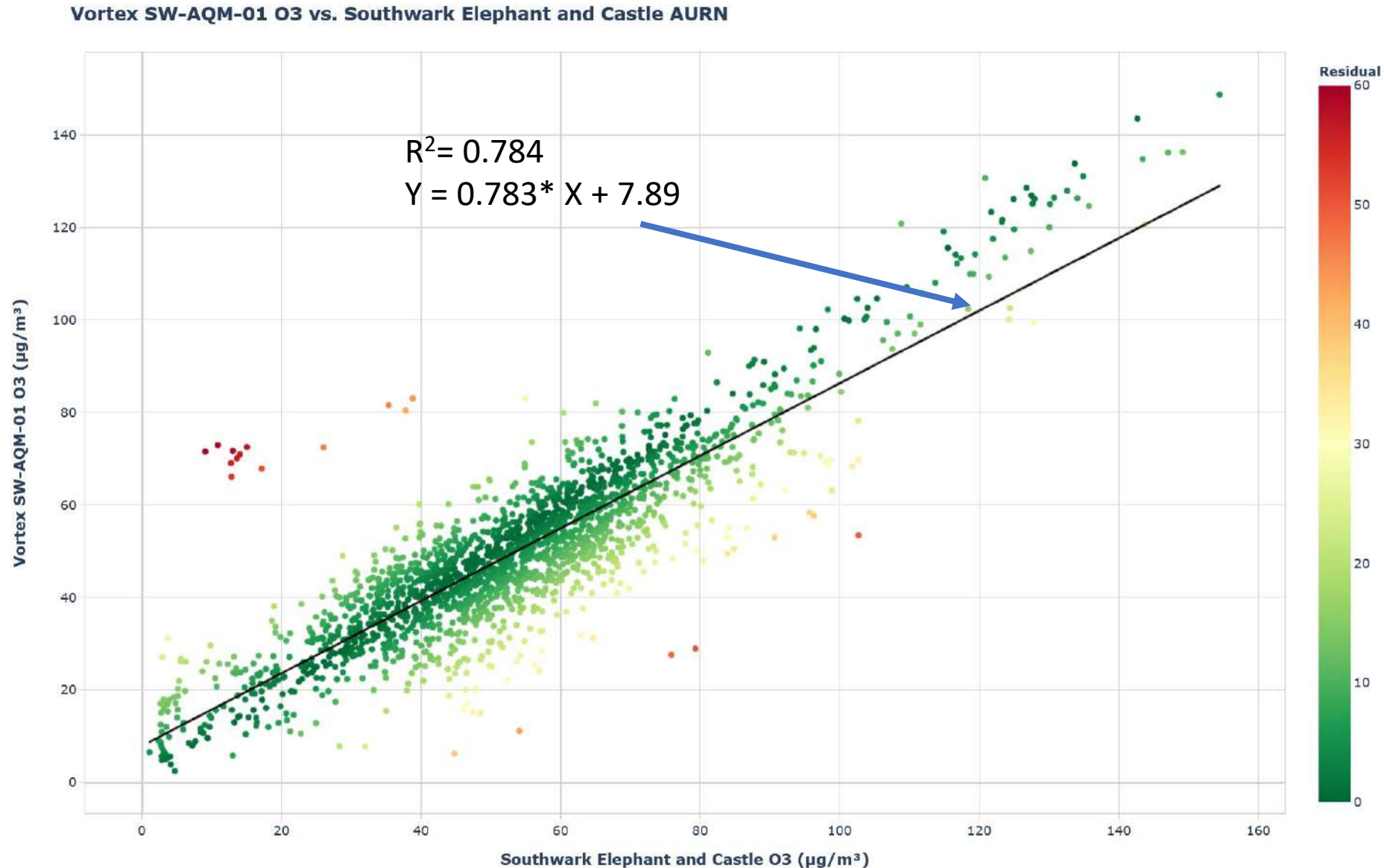


Southwark Deployment – O₃ Data



As before the Vortex sensor SW-AQM-01 was compared to the hourly reference station measurement.

The majority of the data seen occurs below 80µg/m³ however the sensors are in good agreement across the full range.



Southwark Deployment – O₃ Data

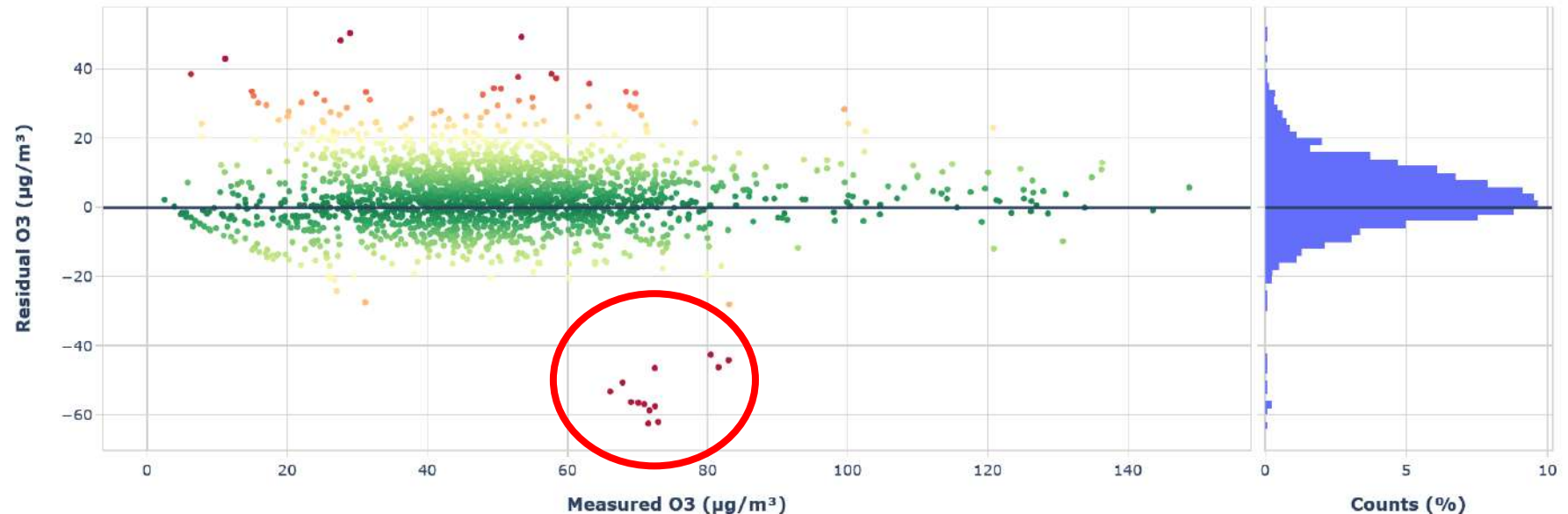


The sensors are in good agreement across the full range of data with the distribution of the residuals remaining consistent across a range of measured values.

Similarly to the NO₂ measurement there is a noticeable unexplained cluster of outliers from the 22nd September

This study includes all data for which the reference station was operational and no outliers have been removed.

Residuals for Vortex SW-AQM-01 O₃ vs. Southwark Elephant and Castle AURN



No outliers are rejected. Good subject for investigation to demonstrate hyperlocal pollution, or improve calibration techniques

