Supplementary File

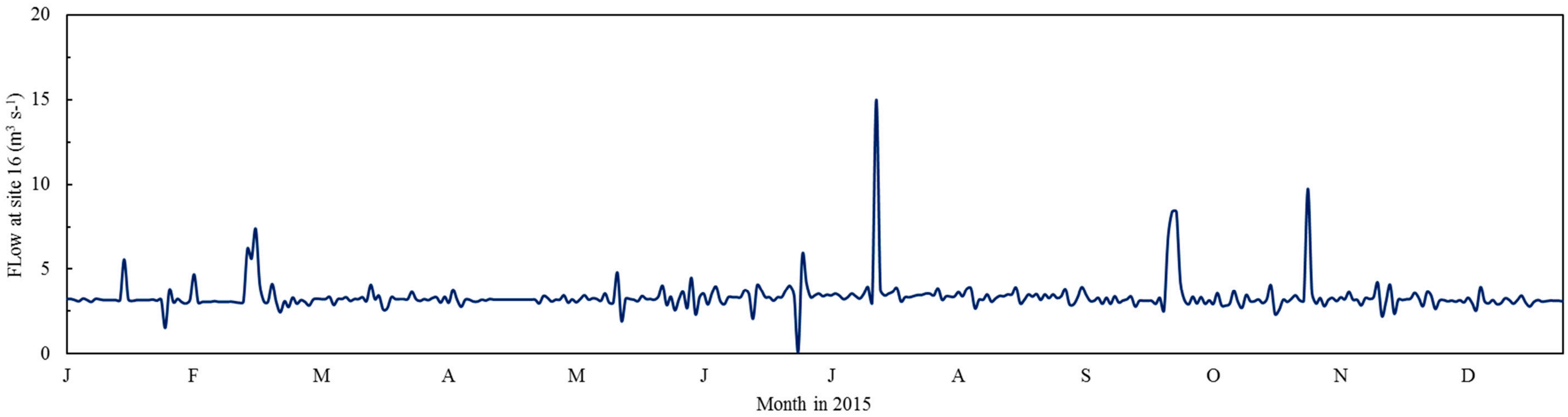

Figure S1. Hydrograph at site 16 in the Nanfei River in 2015.

SOD flux (J_0), is calculated from a linear regression of concentration versus time such that

$$J_0 = m\frac{V_{OLW}}{A_{cylinder}} = \frac{V_{OLW}}{A_{cylinder}}(O_S - O_W) = h(O_S - O_W) \quad \text{(S1)}$$

Where m is the slope of the linear regression for change in concentration per unit time, V_{OLW} is the volume of the overlying water enclosed within the cylinder, and $A_{cylinder}$ is the surface area of the sediment enclosed by the cylinder. With the assumption of a smooth surface area, m can be substituted by the differences of the changes in oxygen concentrations in sediment core (O_S) and control core (O_W) per incubation time (mg L^{-1} d^{-1}). And $\frac{V_{OLW}}{A_{cylinder}}$ can be substituted by the height of the overlying water (m). Finally for the purpose of the model use, the SOD values were transformed to a standard temperature (20 °C) using the following formula:

$$SOD_T = SOD_{20}\theta^{T-20} \quad \text{(S2)}$$

Where, SOD_{20} is the rate value normalized to 20 °C, SOD_T is the rate at incubation temperature, T is the incubation temperature in °C, and θ is the temperature correction coefficient. The θ value of 1.045 was taken in accordance with the parameter used in the model.

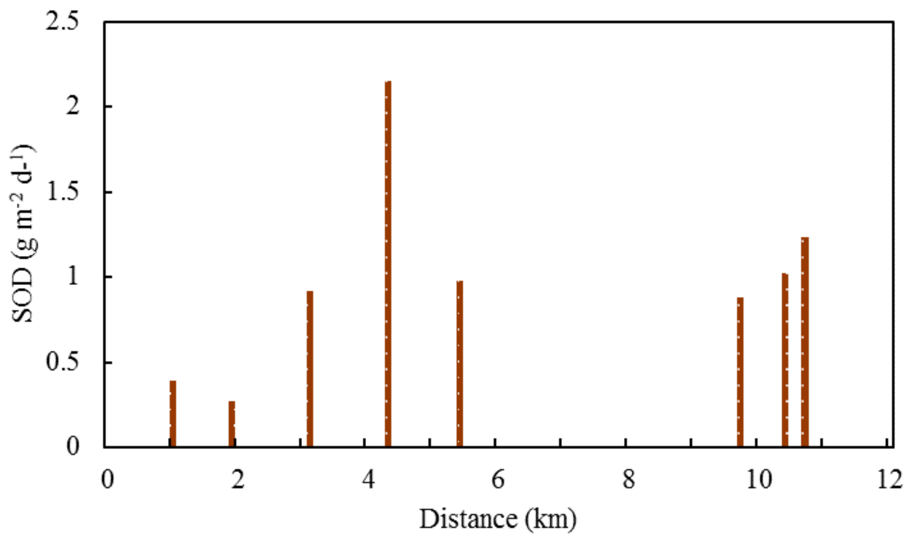

Figure S2. Measured SOD flux rates at sites 1, 2, 3, 4, 7, 14, 15 & 16.

The CBOD deoxygenation rates and nitrification rates were transformed to a standard temperature (20 °C) using the following formula:

$$Rate_T = Rate_{20}\theta^{T-20} \qquad \text{(S3)}$$

Where, $Rate_{20}$ is the rate value normalized to 20 °C, $Rate_T$ is the rate at incubation temperature, T is the incubation temperature in °C, and θ is the temperature correction coefficient. The θ value of 1.045 was taken in accordance with the parameter used in the model.

After calculation, the CBOD deoxygenation rates are 0.30 d^{-1} & 0.09 d^{-1} at sites 3 and 6 respectively, and the nitrification rates are 0.39 d^{-1} & 0.16 d^{-1} at sites 3 and 6 respectively. Considering that the model allows to use different rates for CBOD deoxygenation, the labile CBOD deoxygenation rate from the untreated wastewater was taken as 0.30 d^{-1}, while the refractory CBOD deoxygenation rate from the WWTP1 effluent was taken as 0.16 d^{-1}. However, since the nitrification rate must be consistent for the whole model domain and WWTP1 effluent is more dominant than untreated wastewater for the study reach, 0.16 d^{-1} was taken for the model calculation.

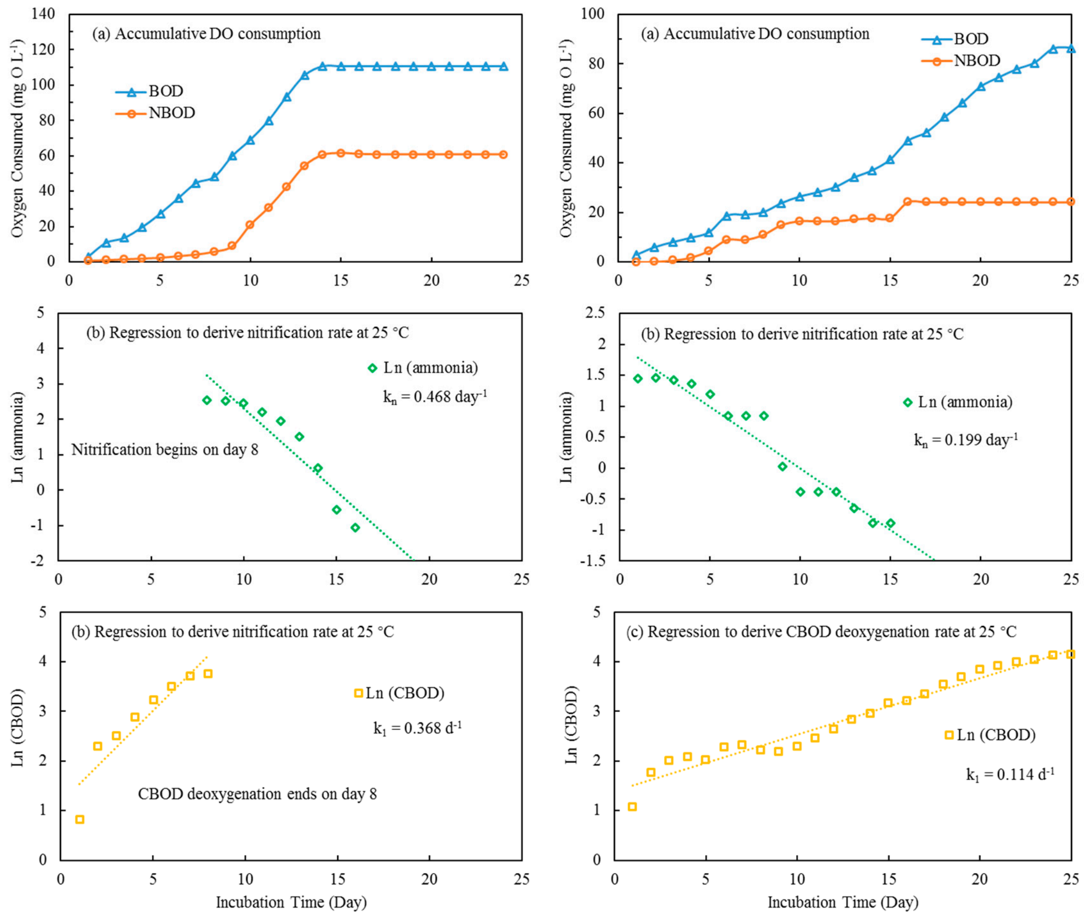

Figure S3. Derivation of CBOD deoxygenation rates and nitrification rates at sites 3 (left) & 6 (right).