Notations for Activated Sludge:

Q = influent flow rate, mgd

S_o = influent soluble substrate concentration (BOD$_5$), mg/L

X_o = biomass concentration in the influent, mg/L (negligible)

V = volume of aeration tank, mil gal

Q_r = return sludge flow rate, mgd

X_v = biomass concentration in the reactor, mg/L (MLVSS)

S_e = soluble substrate (BOD$_5$) concentration in the effluent, mg/L

Q_w = waste sludge flow rate, mgd

$Q - Q_w$ = rate of effluent flow, mgd

X_r = biomass concentration in the sludge return line, mg/L (VSS)

X_e = biomass concentration in the effluent, mg/L (VSS)

Θ_c = sludge age, days (Θ_c = MCRT = SRT = sludge age)

K_s = saturation constant, mg/L

μ = $\dfrac{1}{X}\dfrac{dX}{dt}$ (specific growth rate of the bacteria), $\dfrac{1}{time}$

μ_{max} = maximum specific growth rate

$\dfrac{dX}{dt}$ = bacterial growth rate, $\dfrac{mass}{vol\text{-}time}$

$\dfrac{dS}{dt}$ = substrate utilization rate

$\dfrac{1}{X}\dfrac{dS}{dt}$ = specific substrate utilization rate, U, day^{-1}

k = maximum specific substrate utilization rate, day^{-1}

Y = apparent or theoretical yield, $\dfrac{dX}{dS}$

Y_{obs} = observed yield