



Sales and Service Agreement 63014 “*Sample Analysis*”

BOC ESP Testing - SUMMARY OF RESULTS

April 2015

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Tests performed under agreement

ENERGY REDUCTION POTENTIAL ANALYSIS



Notation

ASCE	American Society of Civil Engineers
CW	Clean water
DO	Dissolved Oxygen
ESP	EcoSystem Plus chemical
ppm	Parts per million
$k_L a$	Volumetric mass transfer coefficient in clean water (t^{-1})
SOTE	Standard oxygen transfer efficiency in clean water (% , or $\frac{mass_{O_2, transferred}}{mass_{O_2, fed}} t^{-1}$)
SOTR	Standard oxygen transfer rate in clean water ($\frac{mass_{O_2, transferred}}{time} t^{-1}$)
α	Alpha factor = Oxygen transfer correction factor for process water
$\alpha k_L a$	$k_L a$ in process water (t^{-1})
$\alpha SOTE$	SOTE in process water (% , or $\frac{mass_{O_2, transferred}}{mass_{O_2, fed}} t^{-1}$)
$\alpha SOTR$	SOTR in process water ($\frac{mass_{O_2, transferred}}{time} t^{-1}$)

Introduction and methods

Energy analyses of the process scenarios with and without Bio-Organic Chemicals ESP were performed. The results of oxygen transfer efficiency indicators were produced using as input the alpha factors from the March 2015 tests on water containing progressively more concentrated solutions of ESP.

The simulations were carried out using a commercial simulator (*BioWin 4*, Envirosim, Hamilton, ON, Canada). The default assumptions were used for biokinetics, per Metcalf & Eddy (2014). A well-mixed aeration tank was assumed, followed by a clarifier (Fig. 1).

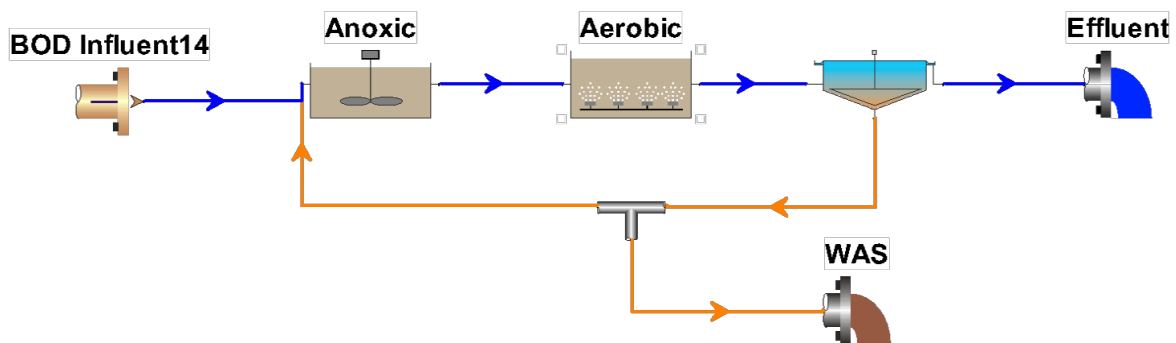


Figure 1. Process layout

The plant operated at a low mean cell retention time (MCRT ~ 3 days), and the aeration system was equipped with fine-pore diffusers in full-floor configuration. Data from a treatment plant in Southern California was used as process input. The energy analyses were to compare the energy intensity variation of different aeration scenarios, hence no other unit operation was included at this point.

The following **scenarios** were included:

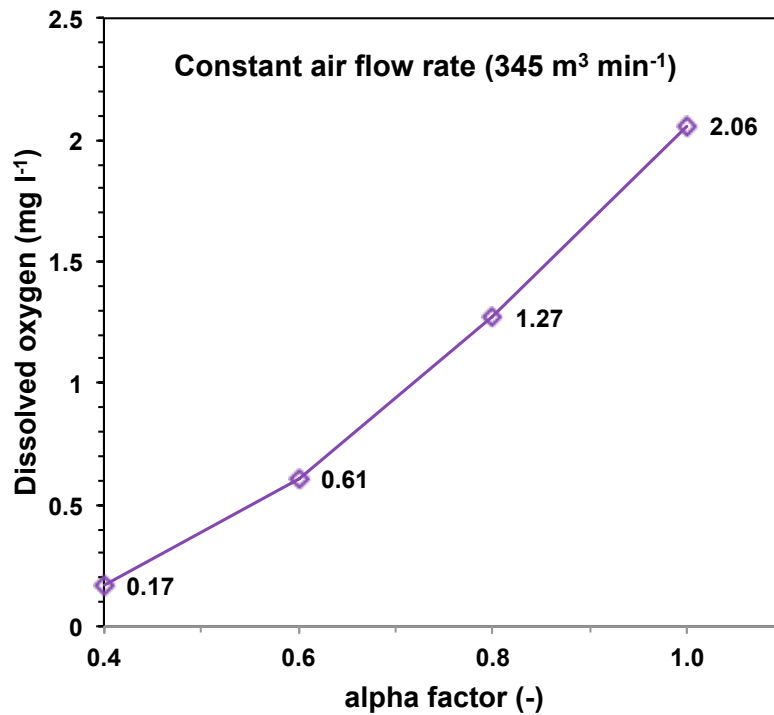
SCENARIO I. Plant operating at a constant air flow rate (AFR) with limited ability to reach the desired DO.

SCENARIO II. Plant operating at constant DO set point with limited to curb aeration energy usage.

All calculation details are reported in the Appendix.

Results

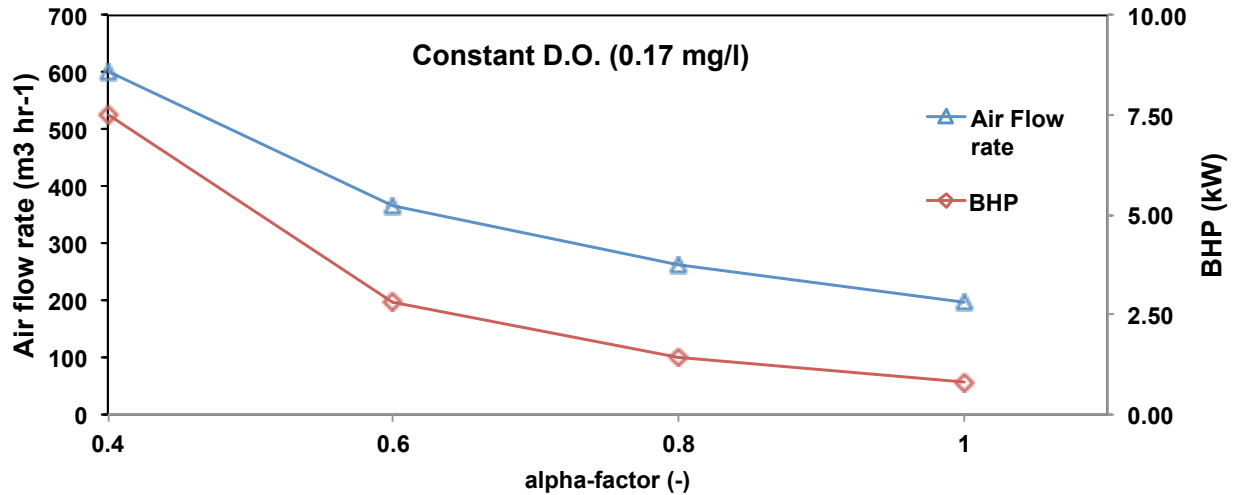
SCENARIO I. Plant operating at a constant air flow rate (AFR) with limited ability to reach the desired DO.



Constant AFR		345 m ³ /hr		
Alpha	D.O. (mg/l)	Power (W/m ³)	Power demand (kW)	BHP
0.4	0.17	5.37	1.85	2.48
0.6	0.61	5.37		
0.8	1.27	5.37		
1.0	2.06	5.37		

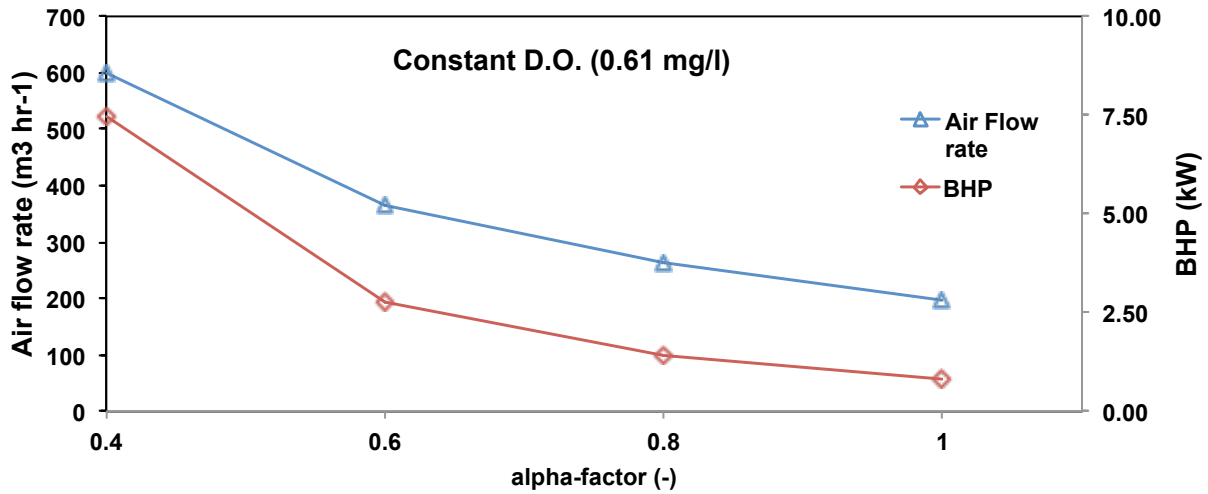
Figure 2. Results of simulation showing dissolved oxygen (in mg/l) within the reactor when the airflow rate is held constant and the alpha-factor varies from 0.4 mg l⁻¹ to 1.0 mg l⁻¹. The air flow rate equals to a flux of 0.337m³ hr⁻¹ diffuser⁻¹. The simulation assumed 1024 diffusers with an area of 0.041m² each, covering 20% of the activated sludge reactor floor.

SCENARIO II. Plant operating at constant DO set point with limited to curb aeration energy usage.



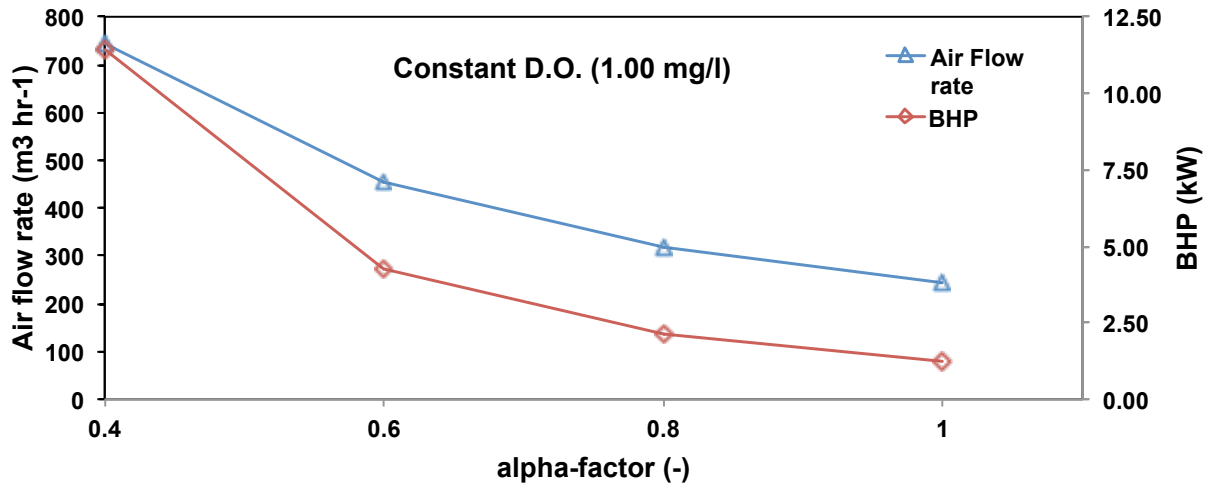
Constant D.O.		0.17 mg/l		
Alpha	AFR (m3/hr)	Power (W/m3)	Power demand (kW)	BHP
0.4	358	5.57	1.99	2.67
0.6	219	3.44	0.75	1.01
0.8	153	2.45	0.37	0.50
1.0	118	1.89	0.22	0.30

Figure 3. Results of simulation with the D.O. in the aeration reactor held constant 0.17 mg l^{-1} . With an increase in alpha-factor, the blue line displays the decline in air flow rate, and the red line displaying the decline in BHP



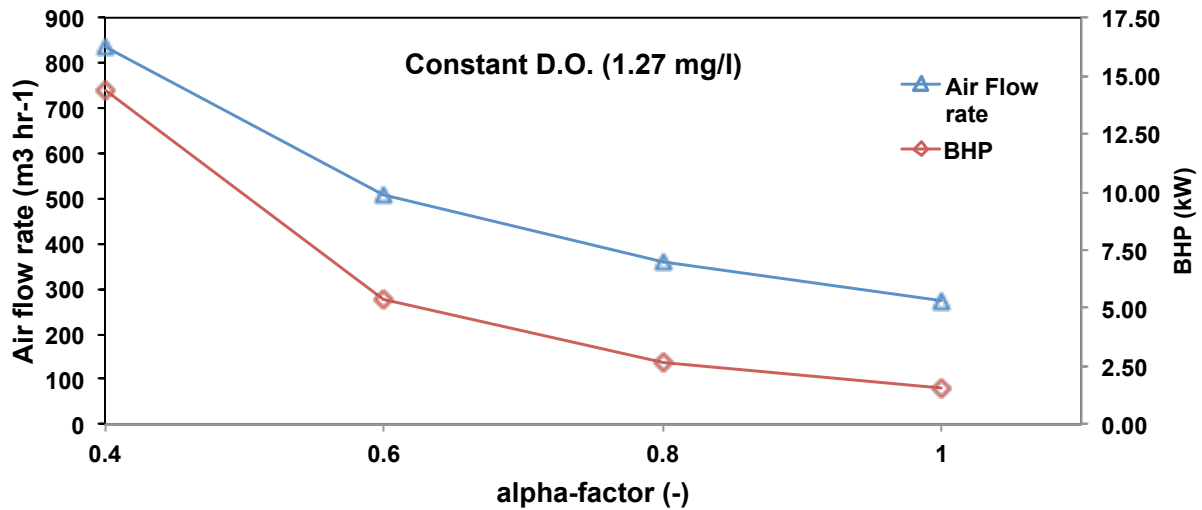
Constant D.O.		0.61 mg/l		
Alpha	AFR (m³/hr)	Power (W/m³)	Power demand (kW)	BHP
0.4	601	9.28	5.58	7.48
0.6	366	5.69	2.08	2.79
0.8	264	4.04	1.07	1.43
1.0	196	3.10	0.61	0.81

Figure 4. Results of simulation with the D.O. in the aeration reactor held constant 0.61 mg l^{-1} . With an increase in alpha-factor, the blue line displays the decline in air flow rate, and the red line displaying the decline in BHP



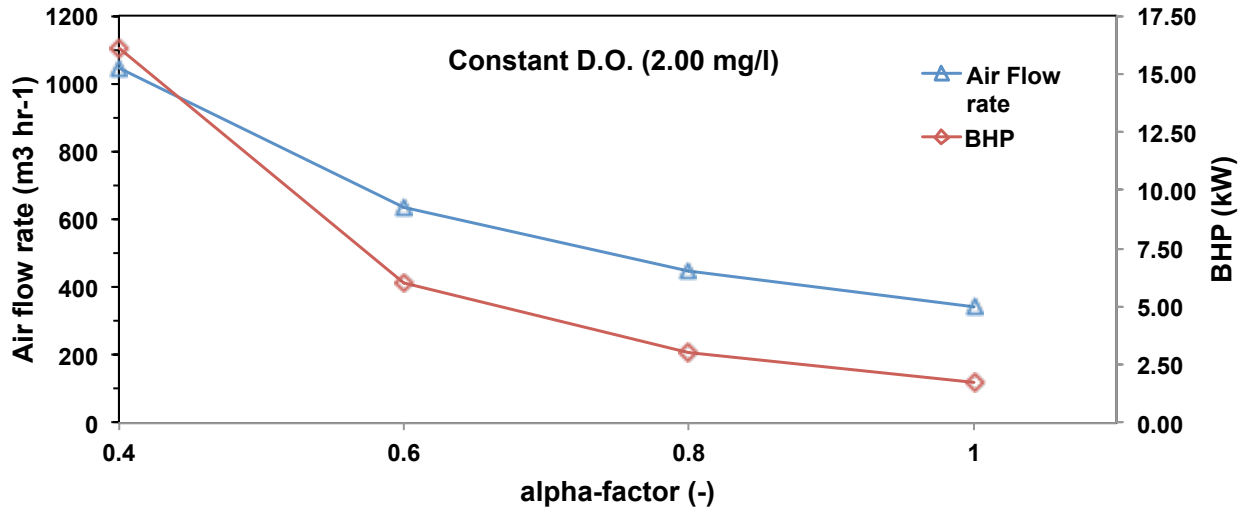
<i>Constant D.O.</i>		<i>1.0 mg/l</i>		
Alpha	AFR (m³/hr)	Power (W/m³)	Power demand (kW)	BHP
0.4	743	11.46	8.51	11.42
0.6	453	7.03	3.18	4.27
0.8	319	4.97	1.59	2.13
1.0	243	3.81	0.93	1.24

Figure 5. Results of simulation with the D.O. in the aeration reactor held constant 1.00 mg l⁻¹. With an increase in alpha-factor, the blue line displays the decline in air flow rate, and the red line displaying the decline in BHP



<i>Constant D.O.</i>		<i>1.27 mg/l</i>		
Alpha	AFR (m³/hr)	Power (W/m³)	Power demand (kW)	BHP
0.4	835	12.87	10.75	14.41
0.6	509	7.89	4.02	5.39
0.8	359	5.58	2.00	2.69
1.0	274	4.27	1.17	1.57

Figure 6. Results of simulation with the D.O. in the aeration reactor held constant 1.27 mg l⁻¹. With an increase in alpha-factor, the blue line displays the decline in air flow rate, and the red line displaying the decline in BHP



<i>Constant D.O.</i>		<i>2.0 mg/l</i>		
Alpha	AFR (m³/hr)	Power (W/m³)	Power demand (kW)	BHP
0.4	1045	11.46	11.98	16.06
0.6	638	7.03	4.49	6.01
0.8	449	4.97	2.23	2.99
1.0	342	3.81	1.30	1.75

Figure 7. Results of simulation with the D.O. in the aeration reactor held constant 2.0 mg l⁻¹. With an increase in alpha-factor, the blue line displays the decline in air flow rate, and the red line displaying the decline in BHP

Appendix – Calculation details

BioWin user and configuration data

Dynamic simulation ON

SRT: 2.94* days

Temperature: 20.0°C

Configuration information for all Bioreactor units

Physical data

Element name	Volume [m3]	Area [m2]	Depth [m]	# of diffusers
Anoxic	236.5000	52.5556	4.500	Un-aerated
Aerobic	945.0000	210.0000	4.500	1024

Operating data Average (flow/time weighted as required)

Element name	Average DO Setpoint [mg/L]
Anoxic	0

Element name	Average Air flow rate [m3/hr (20C, 101.325 kPa or 1 atm)]
Aerobic	345.0

Aeration equipment parameters

Element name	$k_1 \text{ in } C = k_1(PC)^{0.25} + k_2$	$k_2 \text{ in } C = k_1(PC)^{0.25} + k_2$	$Y \text{ in } KLa = C Usg ^ Y - Usg \text{ in } [m^3/(m^2 d)]$	Area of one diffuser	% of tank area covered by diffusers [%]
Anoxic	2.5656	0.0432	0.8200	0.0410	10.0000
Aerobic	2.5656	0.0432	0.8200	0.0410	20.0000



Element name	Alpha (surf) OR Alpha F (diff) [-]	Beta [-]	Surface pressure [kPa]	Fractional effective saturation depth (Fed) [-]
Aerobic	1.0000	0.9500	101.3250	0.3250

Element name	Supply gas CO2 content [vol. %]	Supply gas O2 [vol. %]	Off-gas CO2 [vol. %]	Off-gas O2 [vol. %]	Off-gas H2 [vol. %]	Off-gas NH3 [vol. %]	Off-gas CH4 [vol. %]	Surface turbulence factor [-]
Aerobic	0.0350	20.9500	2.0000	18.8000	0	0	0	2.0000

Configuration information for all BOD Influent units

Operating data Average (flow/time weighted as required)

Element name	BOD Influent14
Flow	3785.412
Total Carbonaceous BOD mgBOD/L	300.00
Volatile suspended solids mgVSS/L	197.76
Total suspended solids mgTSS/L	242.76
Total Kjeldahl Nitrogen mgN/L	40.00
Total P mgP/L	10.00
Nitrate N mgN/L	10.00
pH	7.30
Alkalinity mmol/L	6.00
Calcium mg/L	80.00
Magnesium mg/L	15.00
Dissolved oxygen mg/L	0



Element name	BOD Influent14
Fbs - Readily biodegradable (including Acetate) [gCOD/g of total COD]	0.1600
Fac - Acetate [gCOD/g of readily biodegradable COD]	0.1500
Fxsp - Non-colloidal slowly biodegradable [gCOD/g of slowly degradable COD]	0.5994
Fus - Unbiodegradable soluble [gCOD/g of total COD]	0.0500
Fup - Unbiodegradable particulate [gCOD/g of total COD]	0.1300
Fna - Ammonia [gNH ₃ -N/gTKN]	0.7500
Fnox - Particulate organic nitrogen [gN/g Organic N]	0.5000
Fnus - Soluble unbiodegradable TKN [gN/gTKN]	0.0200
FupN - N:COD ratio for unbiodegradable part. COD [gN/gCOD]	0.0350
Fpo4 - Phosphate [gPO ₄ -P/gTP]	0.5000
FupP - P:COD ratio for unbiodegradable part. COD [gP/gCOD]	0.0110
FZbh - OHO COD fraction [gCOD/g of total COD]	0.0200
FZbm - Methylotroph COD fraction [gCOD/g of total COD]	1.000E-4
FZaob - AOB COD fraction [gCOD/g of total COD]	1.000E-4
FZnob - NOB COD fraction [gCOD/g of total COD]	1.000E-4
FZaao - AAO COD fraction [gCOD/g of total COD]	1.000E-4
FZbp - PAO COD fraction [gCOD/g of total COD]	1.000E-4
FZbpa - Propionic acetogens COD fraction [gCOD/g of total COD]	1.000E-4
FZbam - Acetoclastic methanogens COD fraction [gCOD/g of total COD]	1.000E-4
FZbhm - H ₂ -utilizing methanogens COD fraction [gCOD/g of total COD]	1.000E-4
FZe - Endogenous products COD fraction [gCOD/g of total COD]	0



Configuration information for all Model clarifier units

Physical data

Element name	Volume[m3]	Area[m2]	Depth[m]	Number of layers	Top feed layer	Feed Layers
Sec Settler	800.0000	200.0000	4.000	10	5	1

Operating data Average (flow/time weighted as required)

Element name	Split method	Average Split specification
Sec Settler	Ratio	2.00

Element name	Average Temperature	Reactive
Sec Settler	Uses global setting	No

Local settling parameters

Element name	Maximum Vesilind settling velocity (Vo)	Vesilind hindered zone settling parameter (K) [L/g]	Clarification switching function [mg/L]	Specified TSS conc.for height calc. [mg/L]	Maximum compactability constant [mg/L]
Sec Settler	170.000	0.370	100.0000	2,500.0000	1.500E+4



Configuration information for all Splitter units

Operating data Average (flow/time weighted as required)

Element name	Split method	Average Split specification
WAS Split	Ratio	0.05

BioWin Album

Album page - Tables

Elements	pH []	Volatile suspended solids [mgVSS /L]	Total suspended solids [mgTSS /L]	Total COD [mg/L]	Total Carbonaceous BOD [mg/L]	Ammonia N [mgN/L]	Nitrite N [mgN/L]	Nitrate N [mgN/L]	Total N [mgN/L]	Soluble PO4-P [mgP/L]	Total P [mgP/L]
Anoxic	7.00	1,313.64	1,783.07	2,132.49	772.94	13.00	0.00	6.13	130.88	5.00	71.21
Aerobic	7.00	1,296.79	1,770.70	2,095.59	749.73	5.15	0.00	11.45	129.71	5.00	72.22
Sec Settler	7.00	7.31	9.99	209.16	123.32	5.15	0.00	11.45	18.85	5.00	5.38
WAS	7.00	1,943.24	2,653.77	3,041.07	1,063.53	5.15	0.00	11.45	185.28	5.00	105.74
Effluent	7.00	7.31	9.99	209.16	123.32	5.15	0.00	11.45	18.85	5.00	5.38

Album page - Mass rates

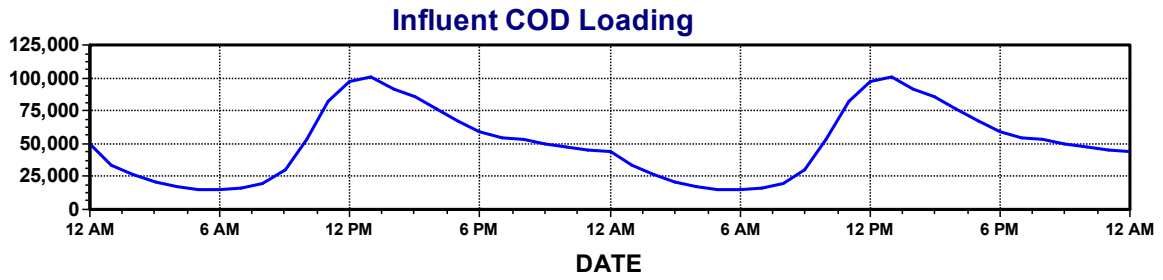
Elements	Total COD [kg /d]	Filtered COD [kg /d]	Total Carbonaceous BOD [kg /d]	Volatile suspended solids [kg VSS/d]	Total suspended solids [kg TSS/d]
Effluent	722.92	685.95	426.22	25.28	34.52
WAS	1,001.02	65.33	350.08	639.65	873.53

Album page - Mass rates

Elements	Total P [kg P/d]	Soluble PO4-P [kg P/d]
Effluent	18.59	17.28
WAS	34.81	1.65



Album page - Inf Flow/COD Load



Album page - Aerobic Info

Aerobic

Parameters	Conc. (mg/L)	Mass rate (kg/d)	Notes
Volatile suspended solids	1,296.79	13,446.11	
Total suspended solids	1,770.70	18,359.97	
Particulate COD	1,897.12	19,670.72	
Filtered COD	198.47	2,057.88	
Total COD	2,095.59	21,728.60	
Soluble PO4-P	5.00	51.84	
Total P	72.22	748.84	
Filtered TKN	6.78	70.26	
Particulate TKN	111.49	1,155.97	
Total Kjeldahl Nitrogen	118.26	1,226.23	
Filtered Carbonaceous BOD	119.77	1,241.86	
Total Carbonaceous BOD	749.73	7,773.79	
Nitrite + Nitrate	11.45	118.72	
Total N	129.71	1,344.95	
Total inorganic N	16.60	172.14	
Alkalinity	4.12	42.74	mmol/L and kmol/d
pH	7.00		
Volatile fatty acids	14.15	146.75	
ISS precipitate	0.00	0.00	
ISS cellular	94.05	975.21	

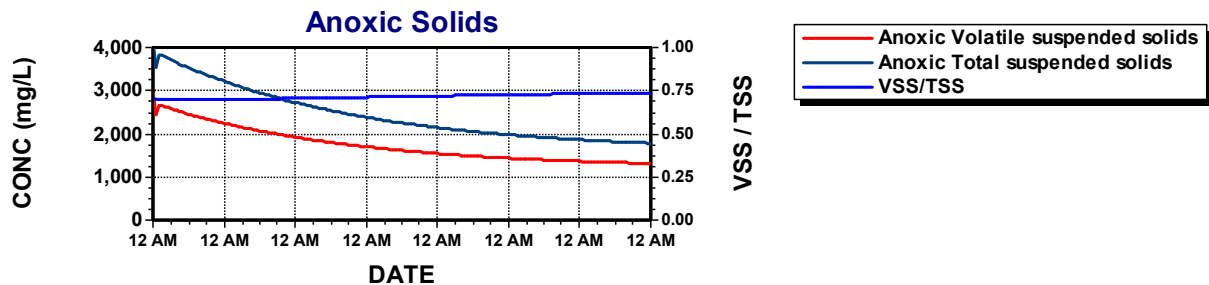


ISS Total	473.91	4,913.86
Ammonia N	5.15	53.42
Nitrate N	11.45	118.72
Parameters	Value	Units
Element HRT	2.2	hours
Velocity gradient	104.56	1/s
VSS destruction	1.28	%
Total solids mass	1,673.32	kg
Total readily biodegradable COD	17.97	mg/L
OUR - Total	31.20	mgO/L/hr
OUR - Carbonaceous	0	mgO/L/hr
OUR - Nitrification	0	mgO/L/hr
Nit - Ammonia removal rate	0	mgN/L/hr
Nit - Nitrous oxide production rate	0	mgN/L/hr
Nit - Nitrite production rate	0	mgN/L/hr
Nit - Nitrate production rate	0	mgN/L/hr
Denit - Nitrate removal rate	0	mgN/L/hr
Denit - Nitrite removal rate	0	mgN/L/hr
Denit - N2 production rate	0	mgN/L/hr
Deamm - Ammonia removal rate	0	mgN/L/hr
Deamm - Nitrite removal rate	0	mgN/L/hr
Deamm - Nitrate production rate	0	mgN/L/hr
Deamm - N2 production rate	0	mgN/L/hr
Off gas flow rate (dry)	354.56	m ³ /hr (field)
Off gas Oxygen	13.95	%
Off gas Carbon dioxide	11.33	%
Off gas Ammonia	0	%
Off gas Hydrogen	0.26	%
Off gas Methane	0	%

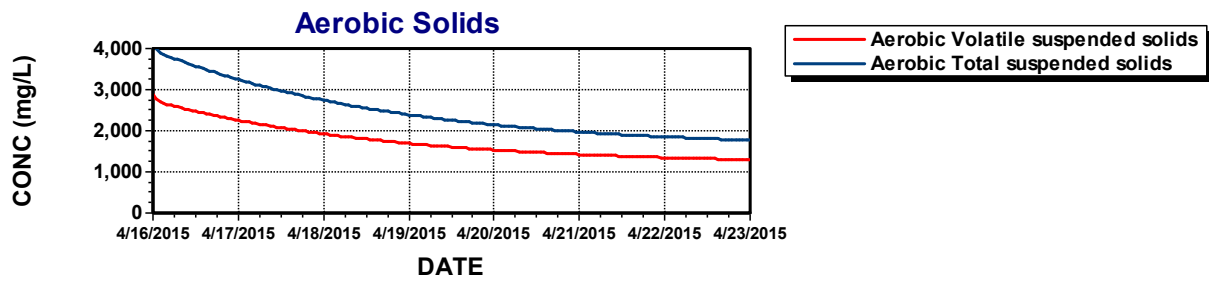


Off gas Nitrous oxide	0	%
Actual DO sat. conc.	8.99	mg/L
OTR	30.37	kg/hr
SOTR	46.23	kg/hr
OTE	31.59	%
SOTE	49.19	%
Air flow rate	345.00	m3/hr (20C, 101.325 kPa or 1 atm)
Air flow rate / diffuser	0.34	m3/hr (20C, 101.325 kPa or 1 atm)
# of diffusers	1,024.00	

Album page - Reactor Solids

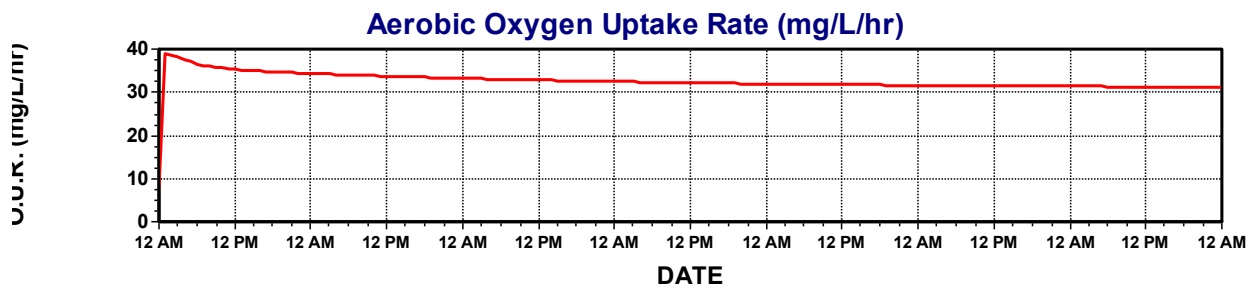


Album page - Reactor Solids

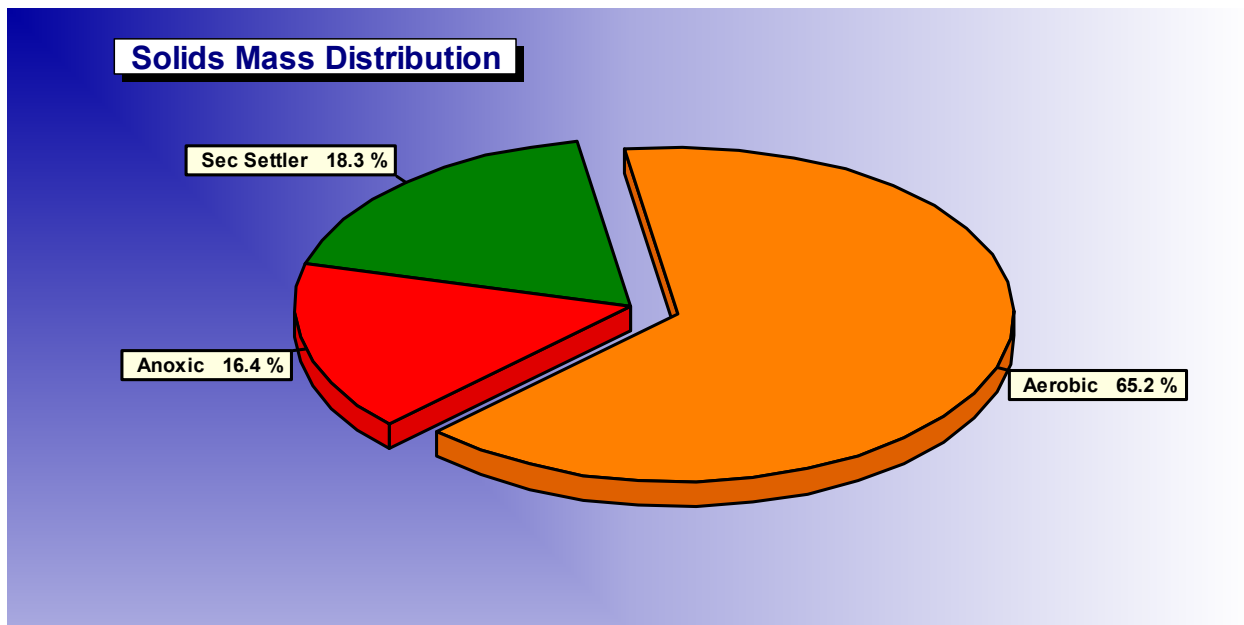




Album page - Aeration #2



Album page - Mass Distribution





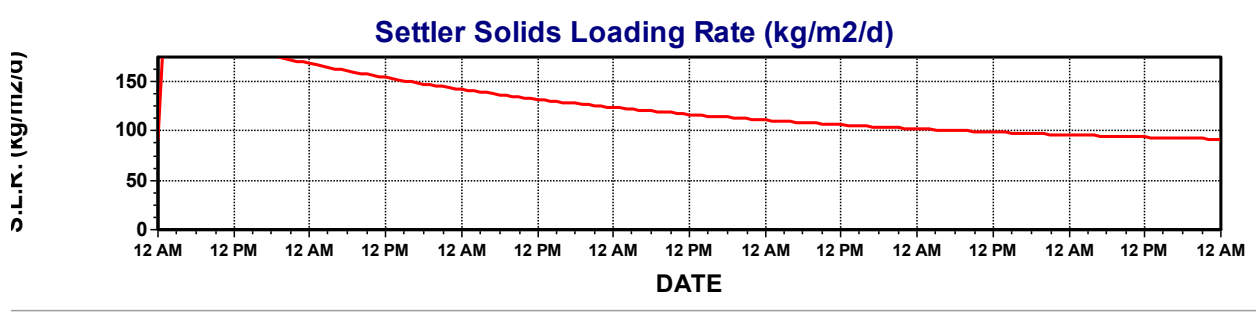
Album page - Settler Info

Sec Settler			
Parameters	Conc. (mg/L)	Mass rate (kg/d)	Notes
Volatile suspended solids	7.31	25.28	
Total suspended solids	9.99	34.52	
Particulate COD	10.70	36.97	
Filtered COD	198.47	685.95	
Total COD	209.16	722.92	
Soluble PO4-P	5.00	17.28	
Total P	5.38	18.59	
Filtered TKN	6.77	23.40	
Particulate TKN	0.63	2.17	
Total Kjeldahl Nitrogen	7.40	25.57	
Filtered Carbonaceous BOD	119.77	413.95	
Total Carbonaceous BOD	123.32	426.22	
Nitrite + Nitrate	11.45	39.57	
Total N	18.85	65.14	
Total inorganic N	16.59	57.35	
Alkalinity	4.12	14.25	mmol/L and kmol/d
pH	7.00		
Volatile fatty acids	14.15	48.92	
ISS precipitate	0	0.00	
ISS cellular	0.53	1.84	
ISS Total	2.68	9.25	
Ammonia N	5.15	17.78	
Nitrate N	11.45	39.57	
Parameters	Value	Units	
Element HRT	1.85	hours	

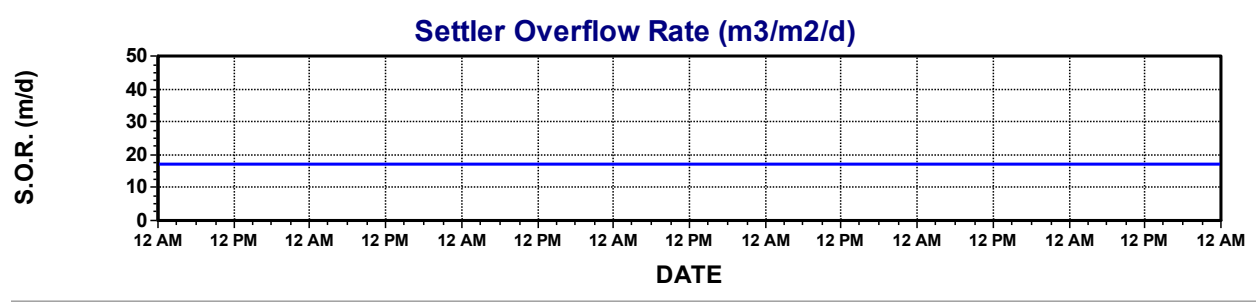


Percent TSS removal	99.81	%
Percent COD removal	96.67	%
Percent BOD removal	94.52	%
Percent TKN removal	97.91	%
Percent Tot. P removal	97.52	%
Height of specified concentration	0.27	m
Total solids mass	469.67	kg
Surface overflow rate	17.28	m ³ /(m ² d)
Solids loading rate	91.80	kg/(m ² d)

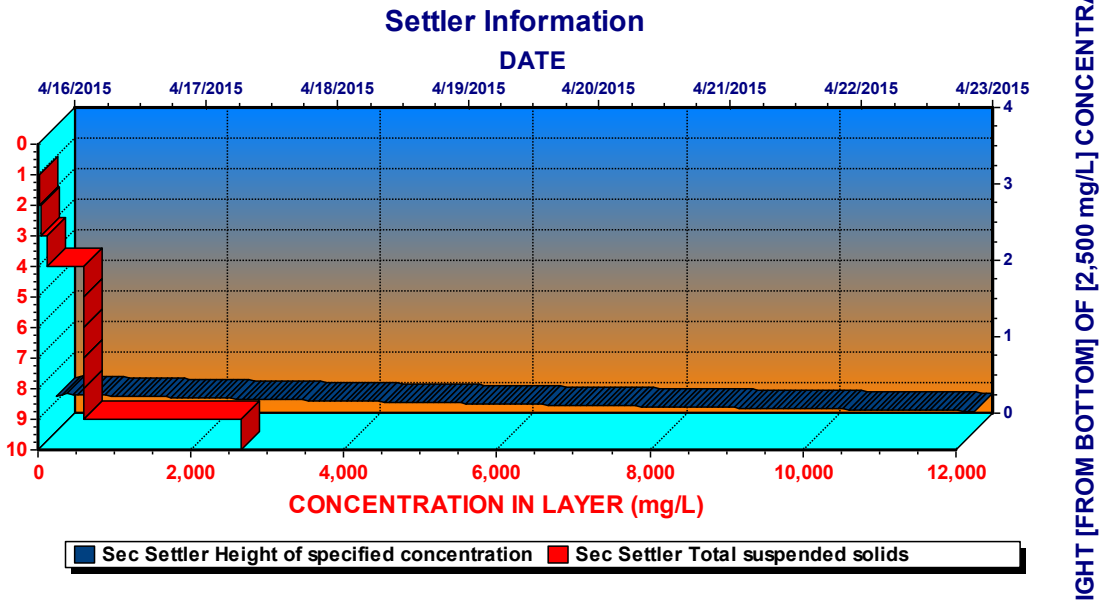
Album page - Settler Loading



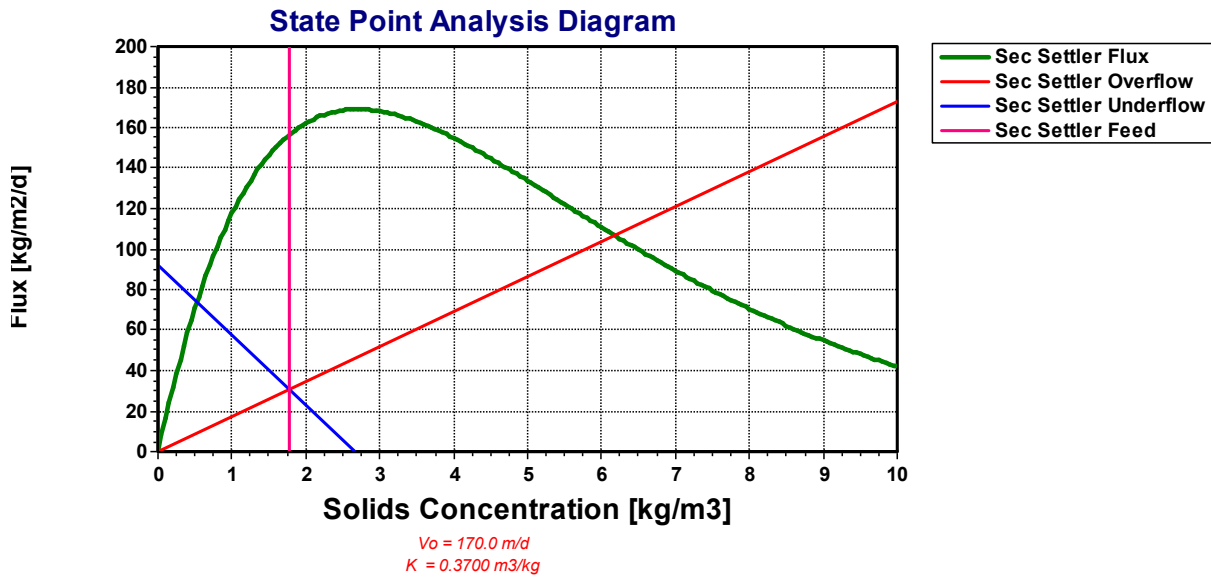
Album page - Settler Loading



Album page - Settler Profile - Blanket



Album page - Settler SPA





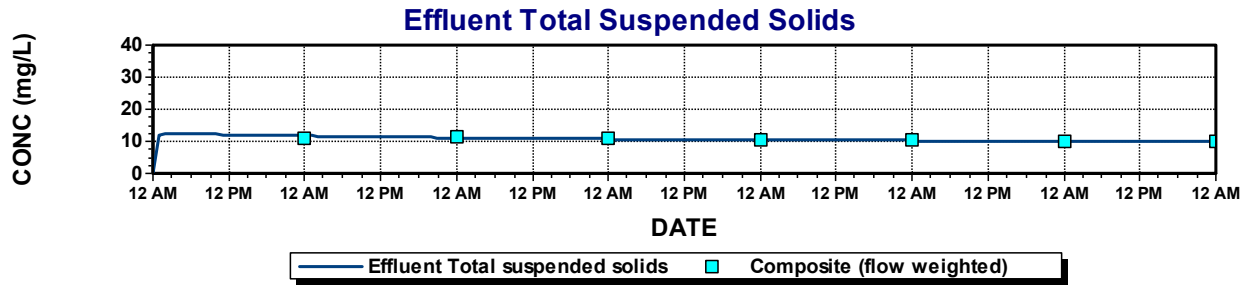
Album page - Eff Info

Effluent			
Parameters	Conc. (mg/L)	Mass rate (kg/d)	Notes
Volatile suspended solids	7.31	25.28	
Total suspended solids	9.99	34.52	
Particulate COD	10.70	36.97	
Filtered COD	198.47	685.95	
Total COD	209.16	722.92	
Soluble PO4-P	5.00	17.28	
Total P	5.38	18.59	
Filtered TKN	6.77	23.40	
Particulate TKN	0.63	2.17	
Total Kjeldahl Nitrogen	7.40	25.57	
Filtered Carbonaceous BOD	119.77	413.95	
Total Carbonaceous BOD	123.32	426.22	
Nitrite + Nitrate	11.45	39.57	
Total N	18.85	65.14	
Total inorganic N	16.59	57.35	
Alkalinity	4.12	14.25	mmol/L and kmol/d
pH	7.00		
Volatile fatty acids	14.15	48.92	
ISS precipitate	0	0.00	
ISS cellular	0.53	1.84	
ISS Total	2.68	9.25	
Ammonia N	5.15	17.78	
Nitrate N	11.45	39.57	
Parameters	Value	Units	
pH	7.00		

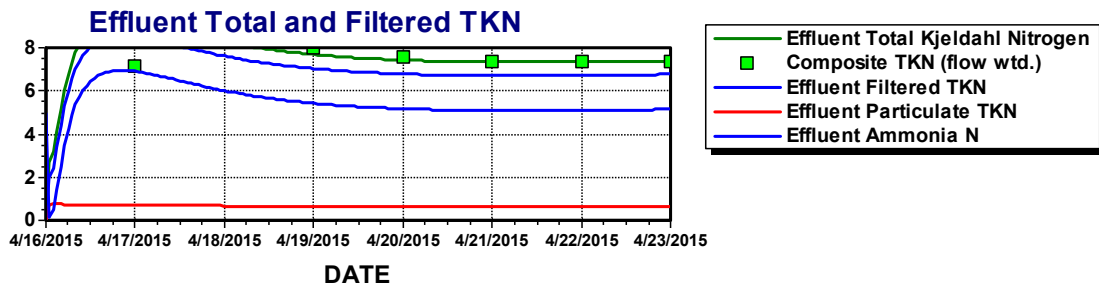


Ionized ammonium	0.37	mmol/L
Unionized ammonia	0.00	mmol/L
Nitrous acid	0.00	mmol/L
Nitrite	0.00	mmol/L
Total dissolved CO ₂	1.25	mmol/L
Bicarbonate	5.74	mmol/L
Carbonate	0.00	mmol/L
Unionized ortho-P	0.00	mmol/L
H ₂ PO ₄ ⁻	0.09	mmol/L
HPO ₄ ⁻⁻	0.07	mmol/L
PO ₄ ⁻⁻⁻	0.00	mmol/L
Metal phosphate (solid)	0	mmol/L
Metal hydroxide (solid)	0	mmol/L
Metal ion	0	mmol/L
MeH ₂ PO ₄ ⁺⁺	0	mmol/L
MeHPO ₄ ⁺	0	mmol/L
Acetic acid	0.00	mmol/L
Acetate	0.22	mmol/L
Propionic acid	0.00	mmol/L
Propionate	0.00	mmol/L
Ionic strength	0.01	
Monovalent act. coeff.	0.90	
Divalent act. coeff.	0.66	
Trivalent act. coeff.	0.40	
Flow	3,456.25	m ³ /d

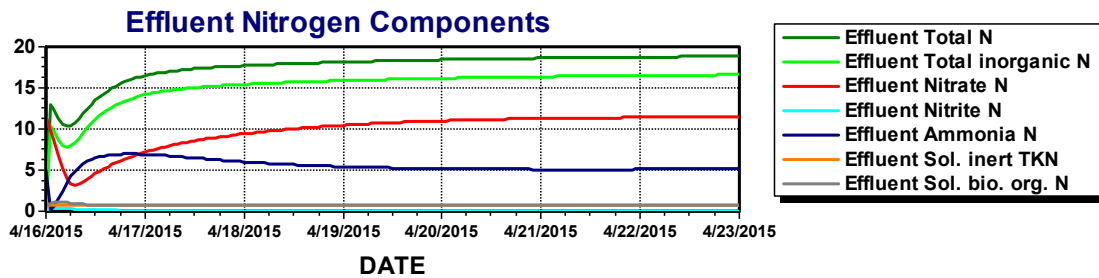
Album page - Eff TSS/TP



Album page - Eff N



Album page - Eff N



Global Parameters

Common

Name	Default	Value	
Hydrolysis rate [1/d]	2.1000	2.1000	1.0290
Hydrolysis half sat. [-]	0.0600	0.0600	1.0000
Anoxic hydrolysis factor [-]	0.2800	0.2800	1.0000
Anaerobic hydrolysis factor (AS) [-]	0.0400	0.0400	1.0000



Anaerobic hydrolysis factor (AD) [-]	0.5000	0.5000	1.0000
Adsorption rate of colloids [L/(mgCOD d)]	0.1500	0.1500	1.0290
Ammonification rate [L/(mgN d)]	0.0400	0.0400	1.0290
Assimilative nitrate/nitrite reduction rate [1/d]	0.5000	0.5000	1.0000
Endogenous products decay rate [1/d]	0	0	1.0000

AOB

Name	Default	Value	
Max. spec. growth rate [1/d]	0.9000	0.9000	1.0720
Substrate (NH4) half sat. [mgN/L]	0.7000	0.7000	1.0000
Byproduct NH4 logistic slope [-]	50.0000	50.0000	1.0000
Byproduct NH4 inflection point [mgN/L]	1.4000	1.4000	1.0000
AOB denite DO half sat. [mg/L]	0.1000	0.1000	1.0000
AOB denite HNO2 half sat. [mgN/L]	5.000E-6	5.000E-6	1.0000
Aerobic decay rate [1/d]	0.1700	0.1700	1.0290
Anoxic/anaerobic decay rate [1/d]	0.0800	0.0800	1.0290
KiHNO2 [mmol/L]	0.0050	0.0050	1.0000

NOB

Name	Default	Value	
Max. spec. growth rate [1/d]	0.7000	0.7000	1.0600
Substrate (NO2) half sat. [mgN/L]	0.1000	0.1000	1.0000
Aerobic decay rate [1/d]	0.1700	0.1700	1.0290
Anoxic/anaerobic decay rate [1/d]	0.0800	0.0800	1.0290
KiNH3 [mmol/L]	0.0750	0.0750	1.0000



AAO

Name	Default	Value	
Max. spec. growth rate [1/d]	0.2000	0.2000	1.1000
Substrate (NH4) half sat. [mgN/L]	2.0000	2.0000	1.0000
Substrate (NO2) half sat. [mgN/L]	1.0000	1.0000	1.0000
Aerobic decay rate [1/d]	0.0190	0.0190	1.0290
Anoxic/anaerobic decay rate [1/d]	0.0095	0.0095	1.0290
Ki Nitrite [mgN/L]	1,000.0000	1,000.0000	1.0000
Nitrite sensitivity constant [L / (d mgN)]	0.0160	0.0160	1.0000

OHO

Name	Default	Value	
Max. spec. growth rate [1/d]	3.2000	3.2000	1.0290
Substrate half sat. [mgCOD/L]	5.0000	5.0000	1.0000
Anoxic growth factor [-]	0.5000	0.5000	1.0000
Denite N2 producers (NO3 or NO2) [-]	0.5000	0.5000	1.0000
Aerobic decay rate [1/d]	0.6200	0.6200	1.0290
Anoxic decay rate [1/d]	0.2330	0.2330	1.0290
Anaerobic decay rate [1/d]	0.1310	0.1310	1.0290
Fermentation rate [1/d]	1.6000	1.6000	1.0290
Fermentation half sat. [mgCOD/L]	5.0000	5.0000	1.0000
Fermentation growth factor (AS) [-]	0.2500	0.2500	1.0000
Free nitrous acid inhibition [mmol/L]	1.000E-7	1.000E-7	1.0000



Methylotrophs

Name	Default	Value	
Max. spec. growth rate [1/d]	1.3000	1.3000	1.0720
Methanol half sat. [mgCOD/L]	0.5000	0.5000	1.0000
Denite N2 producers (NO3 or NO2) [-]	0.5000	0.5000	1.0000
Aerobic decay rate [1/d]	0.0400	0.0400	1.0290
Anoxic/anaerobic decay rate [1/d]	0.0300	0.0300	1.0290
Free nitrous acid inhibition [mmol/L]	1.000E-7	1.000E-7	1.0000

PAO

Name	Default	Value	
Max. spec. growth rate [1/d]	0.9500	0.9500	1.0000
Max. spec. growth rate, P-limited [1/d]	0.4200	0.4200	1.0000
Substrate half sat. [mgCOD(PHB)/mgCOD(Zbp)]	0.1000	0.1000	1.0000
Substrate half sat., P-limited [mgCOD(PHB)/mgCOD(Zbp)]	0.0500	0.0500	1.0000
Magnesium half sat. [mgMg/L]	0.1000	0.1000	1.0000
Cation half sat. [mmol/L]	0.1000	0.1000	1.0000
Calcium half sat. [mgCa/L]	0.1000	0.1000	1.0000
Aerobic/anoxic decay rate [1/d]	0.1000	0.1000	1.0000
Aerobic/anoxic maintenance rate [1/d]	0	0	1.0000
Anaerobic decay rate [1/d]	0.0400	0.0400	1.0000
Anaerobic maintenance rate [1/d]	0	0	1.0000
Sequestration rate [1/d]	4.5000	4.5000	1.0000
Anoxic growth factor [-]	0.3300	0.3300	1.0000



Acetogens

Name	Default	Value	
Max. spec. growth rate [1/d]	0.2500	0.2500	1.0290
Substrate half sat. [mgCOD/L]	10.0000	10.0000	1.0000
Acetate inhibition [mgCOD/L]	10,000.0000	10,000.0000	1.0000
Anaerobic decay rate [1/d]	0.0500	0.0500	1.0290
Aerobic/anoxic decay rate [1/d]	0.5200	0.5200	1.0290

Methanogens

Name	Default	Value	
Acetoclastic max. spec. growth rate [1/d]	0.3000	0.3000	1.0290
H ₂ -utilizing max. spec. growth rate [1/d]	1.4000	1.4000	1.0290
Acetoclastic substrate half sat. [mgCOD/L]	100.0000	100.0000	1.0000
Acetoclastic methanol half sat. [mgCOD/L]	0.5000	0.5000	1.0000
H ₂ -utilizing CO ₂ half sat. [mmol/L]	0.1000	0.1000	1.0000
H ₂ -utilizing substrate half sat. [mgCOD/L]	0.1000	0.1000	1.0000
H ₂ -utilizing methanol half sat. [mgCOD/L]	0.5000	0.5000	1.0000
Acetoclastic propionic inhibition [mgCOD/L]	10,000.0000	10,000.0000	1.0000
Acetoclastic anaerobic decay rate [1/d]	0.1300	0.1300	1.0290
Acetoclastic aerobic/anoxic decay rate [1/d]	0.6000	0.6000	1.0290
H ₂ -utilizing anaerobic decay rate [1/d]	0.1300	0.1300	1.0290
H ₂ -utilizing aerobic/anoxic decay rate [1/d]	2.8000	2.8000	1.0290



pH

Name	Default	Value
OHO low pH limit [-]	4.0000	4.0000
OHO high pH limit [-]	10.0000	10.0000
Methylotrophs low pH limit [-]	4.0000	4.0000
Methylotrophs high pH limit [-]	10.0000	10.0000
Autotrophs low pH limit [-]	5.5000	5.5000
Autotrophs high pH limit [-]	9.5000	9.5000
PAO low pH limit [-]	4.0000	4.0000
PAO high pH limit [-]	10.0000	10.0000
OHO low pH limit (anaerobic) [-]	5.5000	5.5000
OHO high pH limit (anaerobic) [-]	8.5000	8.5000
Propionic acetogens low pH limit [-]	4.0000	4.0000
Propionic acetogens high pH limit [-]	10.0000	10.0000
Acetoclastic methanogens low pH limit [-]	5.0000	5.0000
Acetoclastic methanogens high pH limit [-]	9.0000	9.0000
H2-utilizing methanogens low pH limit [-]	5.0000	5.0000
H2-utilizing methanogens high pH limit [-]	9.0000	9.0000



Switches

Name	Default	Value
Aerobic/anoxic DO half sat. [mgO ₂ /L]	0.0500	0.5000
Anoxic/anaerobic NO _x half sat. [mgN/L]	0.1500	0.1500
AOB DO half sat. [mgO ₂ /L]	0.2500	0.2500
NOB DO half sat. [mgO ₂ /L]	0.5000	0.5000
AAO DO half sat. [mgO ₂ /L]	0.0100	0.0100
Anoxic NO ₃ (->NO ₂) half sat. [mgN/L]	0.1000	0.1000
Anoxic NO ₃ (->N ₂) half sat. [mgN/L]	0.0500	0.0500
Anoxic NO ₂ (->N ₂) half sat. (mgN/L)	0.0100	0.0100
NH ₃ nutrient half sat. [mgN/L]	0.0050	0.0050
PolyP half sat. [mgP/mgCOD]	0.0100	0.0100
VFA sequestration half sat. [mgCOD/L]	5.0000	5.0000
P uptake half sat. [mgP/L]	0.1500	0.1500
P nutrient half sat. [mgP/L]	0.0010	0.0010
Autotroph CO ₂ half sat. [mmol/L]	0.1000	0.1000
H ₂ low/high half sat. [mgCOD/L]	1.0000	1.0000
Propionic acetogens H ₂ inhibition [mgCOD/L]	5.0000	5.0000
Synthesis anion/cation half sat. [meq/L]	0.0100	0.0100



Common

Name	Default	Value
Biomass volatile fraction (VSS/TSS)	0.9200	0.9200
Endogenous residue volatile fraction (VSS/TSS)	0.9200	0.9200
N in endogenous residue [mgN/mgCOD]	0.0700	0.0700
P in endogenous residue [mgP/mgCOD]	0.0220	0.0220
Endogenous residue COD:VSS ratio [mgCOD/mgVSS]	1.4200	1.4200
Particulate substrate COD:VSS ratio [mgCOD/mgVSS]	1.6000	1.6000
Particulate inert COD:VSS ratio [mgCOD/mgVSS]	1.6000	1.6000

AOB

Name	Default	Value
Yield [mgCOD/mgN]	0.1500	0.1500
AOB denite NO2 fraction as TEA [-]	0.5000	0.5000
Byproduct NH4 fraction to N2O [-]	0.0025	0.0025
N in biomass [mgN/mgCOD]	0.0700	0.0700
P in biomass [mgP/mgCOD]	0.0220	0.0220
Fraction to endogenous residue [-]	0.0800	0.0800
COD:VSS ratio [mgCOD/mgVSS]	1.4200	1.4200



NOB

Name	Default	Value
Yield [mgCOD/mgN]	0.0900	0.0900
N in biomass [mgN/mgCOD]	0.0700	0.0700
P in biomass [mgP/mgCOD]	0.0220	0.0220
Fraction to endogenous residue [-]	0.0800	0.0800
COD:VSS ratio [mgCOD/mgVSS]	1.4200	1.4200

AAO

Name	Default	Value
Yield [mgCOD/mgN]	0.1140	0.1140
Nitrate production [mgN/mgBiomassCOD]	2.2800	2.2800
N in biomass [mgN/mgCOD]	0.0700	0.0700
P in biomass [mgP/mgCOD]	0.0220	0.0220
Fraction to endogenous residue [-]	0.0800	0.0800
COD:VSS ratio [mgCOD/mgVSS]	1.4200	1.4200

OHO

Name	Default	Value
Yield (aerobic) [-]	0.6660	0.6660
Yield (fermentation, low H2) [-]	0.1000	0.1000
Yield (fermentation, high H2) [-]	0.1000	0.1000
H2 yield (fermentation low H2) [-]	0.3500	0.3500



H2 yield (fermentation high H2) [-]	0	0
Propionate yield (fermentation, low H2) [-]	0	0
Propionate yield (fermentation, high H2) [-]	0.7000	0.7000
CO2 yield (fermentation, low H2) [-]	0.7000	0.7000
CO2 yield (fermentation, high H2) [-]	0	0
N in biomass [mgN/mgCOD]	0.0700	0.0700
P in biomass [mgP/mgCOD]	0.0220	0.0220
Endogenous fraction - aerobic [-]	0.0800	0.0800
Endogenous fraction - anoxic [-]	0.1030	0.1030
Endogenous fraction - anaerobic [-]	0.1840	0.1840
COD:VSS ratio [mgCOD/mgVSS]	1.4200	1.4200
Yield (anoxic) [-]	0.5400	0.5400
Yield propionic (aerobic) [-]	0.6400	0.6400
Yield propionic (anoxic) [-]	0.4600	0.4600
Yield acetic (aerobic) [-]	0.6000	0.6000
Yield acetic (anoxic) [-]	0.4300	0.4300
Yield methanol (aerobic) [-]	0.5000	0.5000
Adsorp. max. [-]	1.0000	1.0000
Max fraction to N2O at high FNA over nitrate [-]	0.0500	0.0500
Max fraction to N2O at high FNA over nitrite [-]	0.1000	0.1000



Methylotrophs

Name	Default	Value
Yield (anoxic) [-]	0.4000	0.4000
N in biomass [mgN/mgCOD]	0.0700	0.0700
P in biomass [mgP/mgCOD]	0.0220	0.0220
Fraction to endogenous residue [-]	0.0800	0.0800
COD:VSS ratio [mgCOD/mgVSS]	1.4200	1.4200
Max fraction to N ₂ O at high FNA over nitrate [-]	0.1000	0.1000
Max fraction to N ₂ O at high FNA over nitrite [-]	0.1500	0.1500

PAO

Name	Default	Value
Yield (aerobic) [-]	0.6390	0.6390
Yield (anoxic) [-]	0.5200	0.5200
Aerobic P/PHA uptake [mgP/mgCOD]	0.9300	0.9300
Anoxic P/PHA uptake [mgP/mgCOD]	0.3500	0.3500
Yield of PHA on sequestration [-]	0.8890	0.8890
N in biomass [mgN/mgCOD]	0.0700	0.0700
N in sol. inert [mgN/mgCOD]	0.0700	0.0700
P in biomass [mgP/mgCOD]	0.0220	0.0220
Fraction to endogenous part. [-]	0.2500	0.2500
Inert fraction of endogenous sol. [-]	0.2000	0.2000
P/Ac release ratio [mgP/mgCOD]	0.5100	0.5100
COD:VSS ratio [mgCOD/mgVSS]	1.4200	1.4200
Yield of low PP [-]	0.9400	0.9400



Acetogens

Name	Default	Value
Yield [-]	0.1000	0.1000
H2 yield [-]	0.4000	0.4000
CO2 yield [-]	1.0000	1.0000
N in biomass [mgN/mgCOD]	0.0700	0.0700
P in biomass [mgP/mgCOD]	0.0220	0.0220
Fraction to endogenous residue [-]	0.0800	0.0800
COD:VSS ratio [mgCOD/mgVSS]	1.4200	1.4200

Methanogens

Name	Default	Value
Acetoclastic yield [-]	0.1000	0.1000
Methanol acetoclastic yield [-]	0.1000	0.1000
H2-utilizing yield [-]	0.1000	0.1000
Methanol H2-utilizing yield [-]	0.1000	0.1000
N in acetoclastic biomass [mgN/mgCOD]	0.0700	0.0700
N in H2-utilizing biomass [mgN/mgCOD]	0.0700	0.0700
P in acetoclastic biomass [mgP/mgCOD]	0.0220	0.0220
P in H2-utilizing biomass [mgP/mgCOD]	0.0220	0.0220
Acetoclastic fraction to endog. residue [-]	0.0800	0.0800
H2-utilizing fraction to endog. residue [-]	0.0800	0.0800
Acetoclastic COD:VSS ratio [mgCOD/mgVSS]	1.4200	1.4200
H2-utilizing COD:VSS ratio [mgCOD/mgVSS]	1.4200	1.4200

General

Name	Default	Value
Molecular weight of other anions [mg/mmol]	35.5000	35.5000
Molecular weight of other cations [mg/mmol]	39.1000	39.1000
Mg to P mole ratio in polyphosphate [mmolMg/mmolP]	0.3000	0.3000
Cation to P mole ratio in polyphosphate [meq/mmolP]	0.1500	0.1500
Ca to P mole ratio in polyphosphate [mmolCa/mmolP]	0.0500	0.0500
Cation to P mole ratio in organic phosphate [meq/mmolP]	0.0100	0.0100
Bubble rise velocity (anaerobic digester) [cm/s]	23.9000	23.9000
Bubble Sauter mean diameter (anaerobic digester) [cm]	0.3500	0.3500
Anaerobic digester gas hold-up factor []	1.0000	1.0000
Tank head loss per metre of length (from flow) [m/m]	0.0025	0.0025

Mass transfer

Name	Default	Value
KI for H2 [m/d]	17.0000	17.0000 1.0240
KI for CO2 [m/d]	10.0000	10.0000 1.0240
KI for NH3 [m/d]	1.0000	1.0000 1.0240
KI for CH4 [m/d]	8.0000	8.0000 1.0240
KI for N2 [m/d]	15.0000	15.0000 1.0240
KI for N2O [m/d]	8.0000	8.0000 1.0240
KI for O2 [m/d]	13.0000	13.0000 1.0240



Henry's law constants

Name	Default	Value	
CO2 [M/atm]	3.4000E-2	3.4000E-2	2,400.0000
O2 [M/atm]	1.3000E-3	1.3000E-3	1,500.0000
N2 [M/atm]	6.5000E-4	6.5000E-4	1,300.0000
N2O [M/atm]	2.5000E-2	2.5000E-2	2,600.0000
NH3 [M/atm]	5.8000E+1	5.8000E+1	4,100.0000
CH4 [M/atm]	1.4000E-3	1.4000E-3	1,600.0000
H2 [M/atm]	7.8000E-4	7.8000E-4	500.0000

Physico-chemical rates

Name	Default	Value	
Struvite precipitation rate [1/d]	3.000E+10	3.000E+10	1.0240
Struvite redissolution rate [1/d]	3.000E+11	3.000E+11	1.0240
Struvite half sat. [mgTSS/L]	1.0000	1.0000	1.0000
HDP precipitation rate [L/(molP d)]	1.000E+8	1.000E+8	1.0000
HDP redissolution rate [L/(mol P d)]	1.000E+8	1.000E+8	1.0000
HAP precipitation rate [molHDP/(L d)]	5.000E-4	5.000E-4	1.0000



Physico-chemical constants

Name	Default	Value
Struvite solubility constant [mol/L]	6.918E-14	6.918E-14
HDP solubility product [mol/L]	2.750E-22	2.750E-22
HDP half sat. [mgTSS/L]	1.0000	1.0000
Equilibrium soluble PO4 with Al dosing at pH 7 [mgP/L]	0.0100	0.0100
Al to P ratio [molAl/molP]	0.8000	0.8000
Al(OH)3 solubility product [mol/L]	1.259E+9	1.259E+9
AlHPO4+ dissociation constant [mol/L]	7.943E-13	7.943E-13
Equilibrium soluble PO4 with Fe dosing at pH 7 [mgP/L]	0.0100	0.0100
Fe to P ratio [molFe/molP]	1.6000	1.6000
Fe(OH)3 solubility product [mol/L]	0.0500	0.0500
FeH2PO4++ dissociation constant [mol/L]	5.012E-22	5.012E-22



Aeration

Name	Default	Value
Alpha (surf) OR Alpha F (diff) [-]	0.5000	0.5000
Beta [-]	0.9500	0.9500
Surface pressure [kPa]	101.3250	101.3250
Fractional effective saturation depth (Fed) [-]	0.3250	0.3250
Supply gas CO2 content [vol. %]	0.0350	0.0350
Supply gas O2 [vol. %]	20.9500	20.9500
Off-gas CO2 [vol. %]	2.0000	2.0000
Off-gas O2 [vol. %]	18.8000	18.8000
Off-gas H2 [vol. %]	0	0
Off-gas NH3 [vol. %]	0	0
Off-gas CH4 [vol. %]	0	0
Surface turbulence factor [-]	2.0000	2.0000
Set point controller gain []	1.0000	1.0000

Modified Vesilind

Name	Default	Value
Maximum Vesilind settling velocity (Vo) [m/d]	170.000	170.000
Vesilind hindered zone settling parameter (K) [L/g]	0.370	0.370
Clarification switching function [mg/L]	100.000	100.000
Specified TSS conc.for height calc. [mg/L]	2,500.000	2,500.000
Maximum compactability constant [mg/L]	15,000.000	15,000.000



Double exponential

Name	Default	Value
Maximum Vesilind settling velocity (Vo) [m/d]	410.000	410.000
Maximum (practical) settling velocity (Vo') [m/d]	270.000	270.000
Hindered zone settling parameter (Kh) [L/g]	0.400	0.400
Flocculent zone settling parameter (Kf) [L/g]	2.500	2.500
Maximum non-settleable TSS [mg/L]	20.0000	20.0000
Non-settleable fraction [-]	0.0010	0.0010
Specified TSS conc. for height calc. [mg/L]	2,500.0000	2,500.0000

Emission factors

Name	Default	Value
Carbon dioxide equivalence of nitrous oxide	296.0000	296.0000
Carbon dioxide equivalence of methane	23.0000	23.0000



Biofilm general

Name	Default	Value	
Attachment rate [g / (m ² d)]	80.0000	80.0000	1.0000
Attachment TSS half sat. [mg/L]	100.0000	100.0000	1.0000
Detachment rate [g/(m ³ d)]	8.000E+4	8.000E+4	1.0000
Solids movement factor []	10.0000	10.0000	1.0000
Diffusion neta []	0.8000	0.8000	1.0000
Thin film limit [mm]	0.5000	0.5000	1.0000
Thick film limit [mm]	3.0000	3.0000	1.0000
Assumed Film thickness for tank volume correction (temp independent) [mm]	0.7500	0.7500	1.0000
Film surface area to media area ratio - Max. []	1.0000	1.0000	1.0000
Minimum biofilm conc. for streamer formation [gTSS/m ²]	4.0000	4.0000	1.0000

Maximum biofilm concentrations [mg/L]

Name	Default	Value	
Ordinary heterotrophic organisms (OHO)	5.000E+4	5.000E+4	1.0000
Methylotrophs	5.000E+4	5.000E+4	1.0000
Ammonia oxidizing biomass (AOB)	1.000E+5	1.000E+5	1.0000
Nitrite oxidizing biomass (NOB)	1.000E+5	1.000E+5	1.0000
Anaerobic ammonia oxidizers (AAO)	5.000E+4	5.000E+4	1.0000
Polyphosphate accumulating organisms (PAO)	5.000E+4	5.000E+4	1.0000
Propionic acetogens	5.000E+4	5.000E+4	1.0000
Methanogens - acetoclastic	5.000E+4	5.000E+4	1.0000
Methanogens - hydrogenotrophic	5.000E+4	5.000E+4	1.0000
Endogenous products	3.000E+4	3.000E+4	1.0000
Slowly bio. COD (part.)	5,000.0000	5,000.0000	1.0000



Slowly bio. COD (colloid.)	4,000.0000	4,000.0000	1.0000
Part. inert. COD	5,000.0000	5,000.0000	1.0000
Part. bio. org. N	0	0	1.0000
Part. bio. org. P	0	0	1.0000
Part. inert N	0	0	1.0000
Part. inert P	0	0	1.0000
Stored PHA	5,000.0000	5,000.0000	1.0000
Releasable stored polyP	1.150E+6	1.150E+6	1.0000
Fixed stored polyP	1.150E+6	1.150E+6	1.0000
Readily bio. COD (complex)	0	0	1.0000
Acetate	0	0	1.0000
Propionate	0	0	1.0000
Methanol	0	0	1.0000
Dissolved H2	0	0	1.0000
Dissolved methane	0	0	1.0000
Ammonia N	0	0	1.0000
Sol. bio. org. N	0	0	1.0000
Nitrous Oxide N	0	0	1.0000
Nitrite N	0	0	1.0000
Nitrate N	0	0	1.0000
Dissolved nitrogen gas	0	0	1.0000
PO4-P (Sol. & Me Complexed)	1.000E+10	1.000E+10	1.0000
Sol. inert COD	0	0	1.0000
Sol. inert TKN	0	0	1.0000
ISS Influent	1.300E+6	1.300E+6	1.0000
Struvite	8.500E+5	8.500E+5	1.0000
Hydroxy-dicalcium-phosphate	1.150E+6	1.150E+6	1.0000
Hydroxy-apatite	1.600E+6	1.600E+6	1.0000
Magnesium	0	0	1.0000
Calcium	0	0	1.0000
Metal	1.000E+10	1.000E+10	1.0000



Other Cations (strong bases)	0	0	1.0000
Other Anions (strong acids)	0	0	1.0000
Total CO2	0	0	1.0000
User defined 1	0	0	1.0000
User defined 2	0	0	1.0000
User defined 3	5.000E+4	5.000E+4	1.0000
User defined 4	5.000E+4	5.000E+4	1.0000
Dissolved oxygen	0	0	1.0000

Effective diffusivities [m2/s]

Name	Default	Value	
Ordinary heterotrophic organisms (OHO)	5.000E-14	5.000E-14	1.0290
Methylootrophs	5.000E-14	5.000E-14	1.0290
Ammonia oxidizing biomass (AOB)	5.000E-14	5.000E-14	1.0290
Nitrite oxidizing biomass (NOB)	5.000E-14	5.000E-14	1.0290
Anaerobic ammonia oxidizers (AAO)	5.000E-14	5.000E-14	1.0290
Polyphosphate accumulating organisms (PAO)	5.000E-14	5.000E-14	1.0290
Propionic acetogens	5.000E-14	5.000E-14	1.0290
Methanogens - acetoclastic	5.000E-14	5.000E-14	1.0290
Methanogens - hydrogenotrophic	5.000E-14	5.000E-14	1.0290
Endogenous products	5.000E-14	5.000E-14	1.0290
Slowly bio. COD (part.)	5.000E-14	5.000E-14	1.0290
Slowly bio. COD (colloid.)	5.000E-12	5.000E-12	1.0290
Part. inert. COD	5.000E-14	5.000E-14	1.0290
Part. bio. org. N	5.000E-14	5.000E-14	1.0290
Part. bio. org. P	5.000E-14	5.000E-14	1.0290



Part. inert N	5.000E-14	5.000E-14	1.0290
Part. inert P	5.000E-14	5.000E-14	1.0290
Stored PHA	5.000E-14	5.000E-14	1.0290
Releasable stored polyP	5.000E-14	5.000E-14	1.0290
Fixed stored polyP	5.000E-14	5.000E-14	1.0290
Readily bio. COD (complex)	6.900E-10	6.900E-10	1.0290
Acetate	1.240E-9	1.240E-9	1.0290
Propionate	8.300E-10	8.300E-10	1.0290
Methanol	1.600E-9	1.600E-9	1.0290
Dissolved H2	5.850E-9	5.850E-9	1.0290
Dissolved methane	1.963E-9	1.963E-9	1.0290
Ammonia N	2.000E-9	2.000E-9	1.0290
Sol. bio. org. N	1.370E-9	1.370E-9	1.0290
Nitrous Oxide N	1.607E-9	1.607E-9	1.0290
Nitrite N	2.980E-9	2.980E-9	1.0290
Nitrate N	2.980E-9	2.980E-9	1.0290
Dissolved nitrogen gas	1.900E-9	1.900E-9	1.0290
PO4-P (Sol. & Me Complexed)	2.000E-9	2.000E-9	1.0290
Sol. inert COD	6.900E-10	6.900E-10	1.0290
Sol. inert TKN	6.850E-10	6.850E-10	1.0290
ISS Influent	5.000E-14	5.000E-14	1.0290
Struvite	5.000E-14	5.000E-14	1.0290
Hydroxy-dicalcium-phosphate	5.000E-14	5.000E-14	1.0290
Hydroxy-apatite	5.000E-14	5.000E-14	1.0290
Magnesium	7.200E-10	7.200E-10	1.0290
Calcium	7.200E-10	7.200E-10	1.0290
Metal	4.800E-10	4.800E-10	1.0290
Other Cations (strong bases)	1.440E-9	1.440E-9	1.0290
Other Anions (strong acids)	1.440E-9	1.440E-9	1.0290
Total CO2	1.960E-9	1.960E-9	1.0290
User defined 1	6.900E-10	6.900E-10	1.0290



User defined 2	6.900E-10	6.900E-10	1.0290
User defined 3	5.000E-14	5.000E-14	1.0290
User defined 4	5.000E-14	5.000E-14	1.0290
Dissolved oxygen	2.500E-9	2.500E-9	1.0290

EPS Strength coefficients []

Name	Default	Value	
Ordinary heterotrophic organisms (OHO)	1.0000	1.0000	1.0000
Methylotrophs	1.0000	1.0000	1.0000
Ammonia oxidizing biomass (AOB)	5.0000	5.0000	1.0000
Nitrite oxidizing biomass (NOB)	25.0000	25.0000	1.0000
Anaerobic ammonia oxidizers (AAO)	10.0000	10.0000	1.0000
Polyphosphate accumulating organisms (PAO)	1.0000	1.0000	1.0000
Propionic acetogens	1.0000	1.0000	1.0000
Methanogens - acetoclastic	1.0000	1.0000	1.0000
Methanogens - hydrogenotrophic	1.0000	1.0000	1.0000
Endogenous products	1.0000	1.0000	1.0000
Slowly bio. COD (part.)	1.0000	1.0000	1.0000
Slowly bio. COD (colloid.)	1.0000	1.0000	1.0000
Part. inert. COD	1.0000	1.0000	1.0000
Part. bio. org. N	1.0000	1.0000	1.0000
Part. bio. org. P	1.0000	1.0000	1.0000
Part. inert N	1.0000	1.0000	1.0000
Part. inert P	1.0000	1.0000	1.0000
Stored PHA	1.0000	1.0000	1.0000
Releasable stored polyP	1.0000	1.0000	1.0000
Fixed stored polyP	1.0000	1.0000	1.0000
Readily bio. COD (complex)	0	0	1.0000



Acetate	0	0	1.0000
Propionate	0	0	1.0000
Methanol	0	0	1.0000
Dissolved H2	0	0	1.0000
Dissolved methane	0	0	1.0000
Ammonia N	0	0	1.0000
Sol. bio. org. N	0	0	1.0000
Nitrous Oxide N	0	0	1.0000
Nitrite N	0	0	1.0000
Nitrate N	0	0	1.0000
Dissolved nitrogen gas	0	0	1.0000
PO4-P (Sol. & Me Complexed)	1.0000	1.0000	1.0000
Sol. inert COD	0	0	1.0000
Sol. inert TKN	0	0	1.0000
ISS Influent	0.3300	0.3300	1.0000
Struvite	1.0000	1.0000	1.0000
Hydroxy-dicalcium-phosphate	1.0000	1.0000	1.0000
Hydroxy-apatite	1.0000	1.0000	1.0000
Magnesium	0	0	1.0000
Calcium	0	0	1.0000
Metal	1.0000	1.0000	1.0000
Other Cations (strong bases)	0	0	1.0000
Other Anions (strong acids)	0	0	1.0000
Total CO2	0	0	1.0000
User defined 1	0	0	1.0000
User defined 2	0	0	1.0000
User defined 3	1.0000	1.0000	1.0000
User defined 4	1.0000	1.0000	1.0000
Dissolved oxygen	0	0	1.0000
