

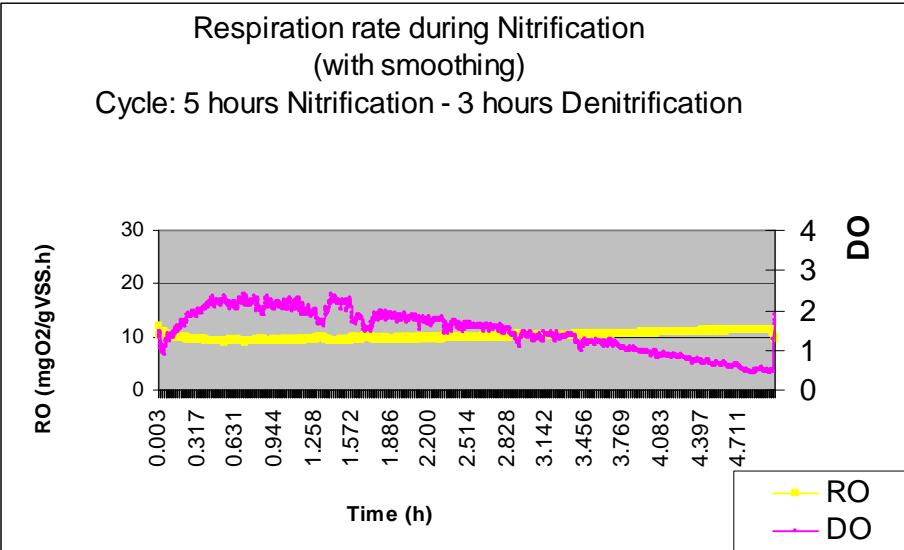
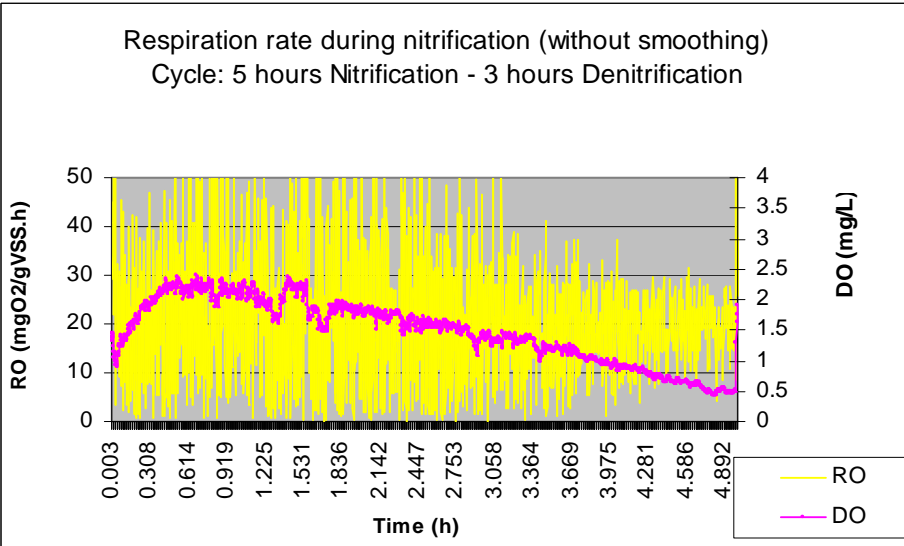
ANNEX 6.1 Savitsky - Golay Filters method

| DO (mg/L) | dSo (mg/L) | Smoothing5pdS0 | Smoothing9pdS | 1st Derive'e | Smoothing5pDO |
|-----------|------------|----------------|---------------|--------------|---------------|
| 1.451 | -0.077 | | | | |
| 1.374 | -0.065 | | | | |
| 1.309 | 0.130 | 0.045 | | -0.030 | 1.357 |
| 1.439 | -0.047 | -0.019 | | -0.044 | 1.402 |
| 1.392 | -0.159 | -0.128 | -0.055 | -0.060 | 1.382 |
| 1.233 | -0.094 | -0.140 | -0.054 | 0.049 | 1.254 |
| 1.139 | -0.099 | -0.018 | -0.095 | 0.014 | 1.115 |
| 1.040 | 0.111 | -0.012 | -0.065 | 0.001 | 1.097 |
| 1.151 | -0.129 | -0.029 | -0.031 | -0.008 | 1.085 |
| 1.022 | -0.048 | -0.095 | -0.020 | -0.001 | 1.056 |
| 0.974 | -0.041 | -0.008 | -0.026 | 0.024 | 0.961 |
| 0.933 | 0.041 | 0.000 | -0.053 | 0.002 | 0.953 |
| 0.974 | -0.035 | -0.007 | -0.014 | -0.008 | 0.953 |
| 0.939 | -0.029 | -0.049 | 0.020 | 0.026 | 0.947 |
| 0.910 | -0.030 | 0.008 | 0.042 | 0.051 | 0.897 |
| 0.880 | 0.112 | 0.080 | 0.028 | 0.022 | 0.905 |
| 0.992 | 0.100 | 0.097 | 0.033 | -0.016 | 0.985 |
| 1.092 | 0.011 | 0.010 | 0.067 | -0.014 | 1.082 |
| 1.103 | -0.040 | -0.010 | 0.069 | 0.027 | 1.092 |
| 1.063 | 0.076 | 0.072 | 0.030 | 0.005 | 1.082 |
| 1.139 | 0.135 | 0.084 | 0.025 | -0.005 | 1.154 |
| 1.274 | -0.035 | 0.021 | 0.026 | -0.029 | 1.237 |
| 1.239 | -0.006 | -0.029 | 0.026 | -0.015 | 1.258 |
| 1.233 | 0.000 | 0.005 | 0.026 | 0.032 | 1.229 |
| 1.233 | 0.029 | 0.032 | 0.027 | 0.031 | 1.234 |
| 1.262 | 0.071 | 0.073 | 0.045 | -0.004 | 1.266 |
| 1.333 | 0.077 | 0.049 | 0.030 | -0.016 | 1.340 |
| 1.410 | -0.029 | 0.013 | 0.001 | -0.045 | 1.389 |
| 1.381 | 0.000 | -0.044 | 0.000 | -0.019 | 1.402 |
| 1.381 | -0.078 | -0.037 | -0.015 | 0.019 | 1.358 |
| 1.303 | 0.006 | -0.003 | -0.045 | -0.009 | 1.321 |
| 1.309 | 0.042 | 0.008 | -0.026 | -0.004 | 1.318 |
| 1.351 | -0.071 | -0.043 | 0.009 | 0.021 | 1.326 |
| 1.280 | -0.041 | -0.020 | 0.031 | 0.030 | 1.283 |
| 1.239 | 0.100 | 0.065 | 0.024 | 0.024 | 1.263 |
| 1.339 | 0.071 | 0.072 | 0.017 | -0.010 | 1.329 |
| 1.410 | -0.006 | 0.009 | 0.015 | -0.044 | 1.401 |
| 1.404 | -0.024 | -0.035 | 0.002 | -0.022 | 1.409 |
| 1.380 | -0.047 | -0.037 | -0.016 | 0.011 | 1.375 |
| 1.333 | -0.012 | -0.010 | -0.027 | 0.013 | 1.337 |
| 1.321 | 0.030 | 0.017 | -0.005 | 0.002 | 1.328 |
| 1.351 | 0.000 | -0.006 | 0.012 | 0.021 | 1.345 |
| 1.351 | -0.030 | 0.013 | 0.021 | -0.005 | 1.339 |
| 1.321 | 0.082 | 0.017 | 0.014 | 0.018 | 1.352 |
| 1.403 | -0.023 | 0.042 | 0.013 | -0.007 | 1.368 |
| 1.380 | 0.058 | -0.008 | 0.052 | 0.017 | 1.411 |
| 1.438 | -0.034 | 0.041 | 0.051 | 0.026 | 1.402 |
| 1.404 | 0.116 | 0.063 | 0.013 | -0.022 | 1.443 |
| 1.520 | 0.053 | 0.052 | 0.013 | -0.029 | 1.506 |

| DO (mg/L) | dSo (mg/L) | Smoothing5pdS0 | Smoothing9pdS | 1st Derive'e | Smoothing5pDO |
|----------------------|-----------------------|-----------------------|----------------------|-------------------------|----------------------|
| 1.462 | 0.112 | 0.062 | 0.033 | -0.005 | 1.493 |
| 1.574 | 0.035 | 0.050 | 0.039 | -0.011 | 1.555 |
| 1.609 | -0.018 | -0.009 | 0.030 | -0.017 | 1.605 |
| 1.591 | 0.000 | 0.002 | 0.009 | -0.006 | 1.596 |
| 1.591 | 0.029 | 0.015 | -0.008 | -0.008 | 1.598 |
| 1.620 | -0.012 | -0.009 | -0.010 | -0.001 | 1.612 |
| 1.608 | -0.035 | -0.011 | -0.025 | -0.024 | 1.603 |
| 1.573 | 0.018 | -0.028 | -0.015 | 0.005 | 1.592 |
| 1.591 | -0.071 | -0.026 | 0.008 | 0.031 | 1.563 |
| 1.520 | 0.019 | 0.008 | 0.013 | 0.024 | 1.538 |
| 1.539 | 0.081 | 0.070 | 0.016 | 0.004 | 1.545 |
| 1.620 | 0.042 | 0.028 | 0.035 | 0.000 | 1.615 |
| 1.662 | -0.041 | 0.002 | 0.043 | -0.001 | 1.643 |
| 1.621 | 0.053 | 0.026 | 0.021 | -0.003 | 1.645 |
| 1.674 | 0.048 | 0.040 | 0.021 | 0.005 | 1.670 |
| 1.722 | -0.012 | 0.008 | 0.016 | -0.007 | 1.710 |
| 1.710 | 0.012 | 0.012 | 0.004 | -0.027 | 1.718 |
| 1.722 | 0.023 | -0.007 | -0.014 | -0.010 | 1.730 |
| 1.745 | -0.071 | -0.029 | -0.028 | -0.015 | 1.723 |
| 1.674 | -0.012 | -0.040 | -0.031 | -0.008 | 1.694 |
| 1.662 | -0.029 | -0.021 | -0.033 | 0.013 | 1.654 |
| 1.633 | -0.025 | -0.025 | 0.000 | 0.018 | 1.633 |
| 1.608 | 0.000 | 0.001 | 0.018 | 0.037 | 1.608 |
| 1.608 | 0.042 | 0.056 | 0.009 | -0.004 | 1.610 |
| 1.650 | 0.083 | 0.030 | 0.038 | 0.004 | 1.666 |
| 1.733 | -0.059 | 0.009 | 0.026 | 0.000 | 1.696 |
| 1.674 | 0.048 | 0.014 | 0.006 | -0.022 | 1.705 |
| 1.722 | 0.040 | 0.018 | 0.023 | 0.021 | 1.719 |
| 1.762 | -0.052 | -0.002 | 0.035 | 0.023 | 1.737 |
| 1.710 | 0.064 | 0.044 | 0.039 | 0.007 | 1.735 |
| 1.774 | 0.099 | 0.076 | 0.029 | -0.003 | 1.779 |
| 1.873 | 0.000 | 0.019 | 0.018 | -0.018 | 1.855 |
| 1.873 | -0.023 | -0.008 | 0.023 | -0.030 | 1.874 |
| 1.850 | 0.023 | -0.017 | 0.010 | 0.021 | 1.865 |
| 1.873 | -0.040 | 0.020 | -0.015 | -0.004 | 1.848 |
| 1.833 | 0.075 | 0.007 | -0.007 | -0.014 | 1.869 |
| 1.908 | -0.047 | -0.005 | 0.007 | 0.003 | 1.876 |
| 1.861 | -0.028 | -0.033 | -0.002 | 0.000 | 1.871 |
| 1.833 | 0.017 | 0.018 | -0.016 | -0.002 | 1.838 |
| 1.850 | 0.029 | 0.002 | -0.017 | -0.002 | 1.856 |
| 1.879 | -0.058 | -0.026 | 0.018 | 0.014 | 1.858 |
| 1.821 | 0.000 | -0.003 | 0.023 | 0.023 | 1.832 |
| 1.821 | 0.069 | 0.056 | 0.025 | 0.019 | 1.829 |
| 1.890 | 0.053 | 0.049 | 0.027 | 0.001 | 1.885 |
| 1.943 | 0.006 | 0.025 | 0.034 | -0.024 | 1.935 |
| 1.949 | 0.023 | -0.001 | 0.025 | -0.007 | 1.960 |
| 1.972 | -0.023 | 0.007 | -0.015 | -0.010 | 1.959 |
| 1.949 | 0.023 | -0.003 | -0.015 | -0.025 | 1.965 |
| 1.972 | -0.029 | -0.033 | -0.007 | 0.017 | 1.962 |
| 1.943 | -0.065 | -0.016 | -0.008 | -0.007 | 1.930 |
| 1.878 | 0.071 | -0.001 | -0.005 | 0.015 | 1.914 |
| 1.949 | -0.041 | 0.025 | -0.027 | -0.018 | 1.913 |

| | Time(s) | Time (h) | Smoothing5pDO | dt (h) | dSo (mg/L) | 1st Derive'e | Kla (h-1) | (S*-So) | Ro=Kla(S*-So)-dSo/dt | Ro (VSS) | |
|---------|---------|----------|---------------|----------|------------|--------------|-----------|----------|----------------------|----------|-------------|
| 9:00:06 | 10 | 0.002778 | | 0.002778 | 0 | | 2.13 | 9.5 | 20.235 | 11.95922 | 20.235 |
| 9:00:16 | 20 | 0.005556 | | 0.002778 | 1.356571 | | 2.13 | 9.5 | 20.235 | 11.95922 | 20.235 |
| 9:00:26 | 30 | 0.008333 | 1.356571429 | 0.002778 | 0.044971 | -0.0305 | 2.13 | 8.143429 | 17.376 | 10.26951 | 17.37600286 |
| 9:00:36 | 40 | 0.011111 | 1.401542857 | 0.002778 | -0.01914 | -0.0441 | 2.13 | 8.098457 | 17.29381 | 10.22093 | 17.29381371 |
| 9:00:46 | 50 | 0.013889 | 1.3824 | 0.002778 | -0.12823 | -0.0604 | 2.13 | 8.1176 | 17.35089 | 10.25466 | 17.350888 |
| 9:00:56 | 60 | 0.016667 | 1.254171429 | 0.002778 | -0.1396 | 0.0487 | 2.13 | 8.245829 | 17.51491 | 10.3516 | 17.51491486 |
| 9:01:06 | 70 | 0.019444 | 1.114571429 | 0.002778 | -0.01757 | 0.0136 | 2.13 | 8.385429 | 17.84736 | 10.54809 | 17.84736286 |
| 9:01:16 | 80 | 0.022222 | 1.097 | 0.002778 | -0.01209 | 0.0014 | 2.13 | 8.403 | 17.89699 | 10.57742 | 17.89699 |
| 9:01:26 | 90 | 0.025000 | 1.084914286 | 0.002778 | -0.02906 | -0.0084 | 2.13 | 8.415086 | 17.93253 | 10.59842 | 17.93253257 |
| 9:01:36 | 100 | 0.027778 | 1.055857143 | 0.002778 | -0.09463 | -0.0011 | 2.13 | 8.444143 | 17.98712 | 10.63069 | 17.98712429 |
| 9:01:46 | 110 | 0.030556 | 0.961228571 | 0.002778 | -0.00826 | 0.0242 | 2.13 | 8.538771 | 18.16338 | 10.73486 | 18.16338314 |
| 9:01:56 | 120 | 0.033333 | 0.952971429 | 0.002778 | 0.000457 | 0.0015 | 2.13 | 8.547029 | 18.20367 | 10.75867 | 18.20367086 |
| 9:02:06 | 130 | 0.036111 | 0.953428571 | 0.002778 | -0.0068 | -0.0078 | 2.13 | 8.546571 | 18.212 | 10.76359 | 18.21199714 |
| 9:02:16 | 140 | 0.038889 | 0.946628571 | 0.002778 | -0.04949 | 0.0259 | 2.13 | 8.553371 | 18.19278 | 10.75223 | 18.19278114 |
| 9:02:26 | 150 | 0.041667 | 0.897142857 | 0.002778 | 0.008314 | 0.0511 | 2.13 | 8.602857 | 18.27299 | 10.79964 | 18.27298571 |
| 9:02:36 | 160 | 0.044444 | 0.905457143 | 0.002778 | 0.079943 | 0.0221 | 2.13 | 8.594543 | 18.28428 | 10.80631 | 18.28427629 |
| 9:02:46 | 170 | 0.047222 | 0.9854 | 0.002778 | 0.096743 | -0.0161 | 2.13 | 8.5146 | 18.1522 | 10.72825 | 18.152198 |
| 9:02:56 | 180 | 0.050000 | 1.082142857 | 0.002778 | 0.0098 | -0.0136 | 2.13 | 8.417857 | 17.94364 | 10.60499 | 17.94363571 |
| 9:03:06 | 190 | 0.052778 | 1.091942857 | 0.002778 | -0.00974 | 0.027 | 2.13 | 8.408057 | 17.88216 | 10.56865 | 17.88216171 |
| 9:03:16 | 200 | 0.055556 | 1.0822 | 0.002778 | 0.071543 | 0.0048 | 2.13 | 8.4178 | 17.92511 | 10.59404 | 17.925114 |
| 9:03:26 | 210 | 0.058333 | 1.153742857 | 0.002778 | 0.083571 | -0.0049 | 2.13 | 8.346257 | 17.78243 | 10.50971 | 17.78242771 |
| 9:03:36 | 220 | 0.061111 | 1.237314286 | 0.002778 | 0.020714 | -0.0293 | 2.13 | 8.262686 | 17.62882 | 10.41892 | 17.62882057 |
| 9:03:46 | 230 | 0.063889 | 1.258028571 | 0.002778 | -0.02897 | -0.0148 | 2.13 | 8.241971 | 17.5702 | 10.38428 | 17.57019914 |
| 9:03:56 | 240 | 0.066667 | 1.229057143 | 0.002778 | 0.0048 | 0.0318 | 2.13 | 8.270943 | 17.58531 | 10.39321 | 17.58530829 |
| 9:04:06 | 250 | 0.069444 | 1.233857143 | 0.002778 | 0.032343 | 0.0314 | 2.13 | 8.266143 | 17.57548 | 10.3874 | 17.57548429 |
| 9:04:16 | 260 | 0.072222 | 1.2662 | 0.002778 | 0.073314 | -0.0039 | 2.13 | 8.2338 | 17.54189 | 10.36755 | 17.541894 |
| 9:04:26 | 270 | 0.075000 | 1.339514286 | 0.002778 | 0.049314 | -0.0158 | 2.13 | 8.160486 | 17.39763 | 10.28229 | 17.39763457 |
| 9:04:36 | 280 | 0.077778 | 1.388828571 | 0.002778 | 0.012914 | -0.0453 | 2.13 | 8.111171 | 17.3221 | 10.23764 | 17.32209514 |
| 9:04:46 | 290 | 0.080556 | 1.401742857 | 0.002778 | -0.0438 | -0.0185 | 2.13 | 8.098257 | 17.26779 | 10.20555 | 17.26778771 |
| 9:04:56 | 300 | 0.083333 | 1.357942857 | 0.002778 | -0.03694 | 0.019 | 2.13 | 8.142057 | 17.32358 | 10.23852 | 17.32358171 |

| | Time(s) | Time (h) | Smoothing5pDO | dt (h) | dSo (mg/L) | 1st Derive'e | Kla (h-1) | (S*-So) | Ro=Kla(S*-So)-dSo/dt | Ro (VSS) | |
|---------|---------|----------|---------------|----------|------------|--------------|-----------|----------|----------------------|----------|-------------|
| 9:05:16 | 320 | 0.088889 | 1.317657143 | 0.002778 | 0.008314 | -0.0044 | 2.13 | 8.182343 | 17.43279 | 10.30307 | 17.43279029 |
| 9:05:26 | 330 | 0.091667 | 1.325971429 | 0.002778 | -0.04323 | 0.0205 | 2.13 | 8.174029 | 17.39018 | 10.27788 | 17.39018086 |
| 9:05:36 | 340 | 0.094444 | 1.282742857 | 0.002778 | -0.01966 | 0.03 | 2.13 | 8.217257 | 17.47276 | 10.32669 | 17.47275771 |
| 9:05:46 | 350 | 0.097222 | 1.263085714 | 0.002778 | 0.065457 | 0.0236 | 2.13 | 8.236914 | 17.52103 | 10.35522 | 17.52102743 |
| 9:05:56 | 360 | 0.100000 | 1.328542857 | 0.002778 | 0.072286 | -0.0096 | 2.13 | 8.171457 | 17.4148 | 10.29244 | 17.41480371 |
| 9:06:06 | 370 | 0.102778 | 1.400828571 | 0.002778 | 0.008657 | -0.0436 | 2.13 | 8.099171 | 17.29484 | 10.22153 | 17.29483514 |
| 9:06:16 | 380 | 0.105556 | 1.409485714 | 0.002778 | -0.03489 | -0.0219 | 2.13 | 8.090514 | 17.2547 | 10.19781 | 17.25469543 |
| 9:06:26 | 390 | 0.108333 | 1.3746 | 0.002778 | -0.03723 | 0.0114 | 2.13 | 8.1254 | 17.2957 | 10.22205 | 17.295702 |
| 9:06:36 | 400 | 0.111111 | 1.337371429 | 0.002778 | -0.0096 | 0.0125 | 2.13 | 8.162629 | 17.3739 | 10.26826 | 17.37389886 |
| 9:06:46 | 410 | 0.113889 | 1.327771429 | 0.002778 | 0.017057 | 0.0016 | 2.13 | 8.172229 | 17.40525 | 10.28679 | 17.40524686 |
| 9:06:56 | 420 | 0.116667 | 1.344828571 | 0.002778 | -0.006 | 0.021 | 2.13 | 8.155171 | 17.34952 | 10.25385 | 17.34951514 |
| 9:07:06 | 430 | 0.119444 | 1.338828571 | 0.002778 | 0.012943 | -0.0047 | 2.13 | 8.161171 | 17.388 | 10.27659 | 17.38799514 |
| 9:07:16 | 440 | 0.122222 | 1.351771429 | 0.002778 | 0.016686 | 0.0181 | 2.13 | 8.148229 | 17.33763 | 10.24682 | 17.33762686 |
| 9:07:26 | 450 | 0.125000 | 1.368457143 | 0.002778 | 0.042314 | -0.0066 | 2.13 | 8.131543 | 17.32679 | 10.24042 | 17.32678629 |
| 9:07:36 | 460 | 0.127778 | 1.410771429 | 0.002778 | -0.00834 | 0.0173 | 2.13 | 8.089229 | 17.21276 | 10.17302 | 17.21275686 |
| 9:07:46 | 470 | 0.130556 | 1.402428571 | 0.002778 | 0.040571 | 0.0263 | 2.13 | 8.097571 | 17.22153 | 10.17821 | 17.22152714 |
| 9:07:56 | 480 | 0.133333 | 1.443 | 0.002778 | 0.063371 | -0.0221 | 2.13 | 8.057 | 17.18351 | 10.15574 | 17.18351 |
| 9:08:06 | 490 | 0.136111 | 1.506371429 | 0.002778 | 0.051543 | -0.0289 | 2.13 | 7.993629 | 17.05533 | 10.07998 | 17.05532886 |
| 9:08:16 | 500 | 0.138889 | 1.557914286 | 0.002778 | -0.04506 | -0.0275 | 2.13 | 7.942086 | 16.94414 | 10.01427 | 16.94414257 |
| 9:08:26 | 510 | 0.141667 | 1.512857143 | 0.002778 | -0.04631 | -0.0052 | 2.13 | 7.987143 | 17.01781 | 10.05781 | 17.01781429 |
| 9:08:36 | 520 | 0.144444 | 1.466542857 | 0.002778 | -0.01694 | 0.0512 | 2.13 | 8.033457 | 17.06006 | 10.08278 | 17.06006371 |
| 9:08:46 | 530 | 0.147222 | 1.4496 | 0.002778 | 0.043 | 0.0312 | 2.13 | 8.0504 | 17.11615 | 10.11593 | 17.116152 |
| 9:08:56 | 540 | 0.150000 | 1.4926 | 0.002778 | 0.0622 | -0.0054 | 2.13 | 8.0074 | 17.06116 | 10.08343 | 17.061162 |
| 9:09:06 | 550 | 0.152778 | 1.5548 | 0.002778 | 0.050171 | -0.0108 | 2.13 | 7.9452 | 16.93408 | 10.00832 | 16.934076 |
| 9:09:16 | 560 | 0.155556 | 1.604971429 | 0.002778 | -0.00883 | -0.0172 | 2.13 | 7.895029 | 16.83361 | 9.948943 | 16.83361086 |
| 9:09:26 | 570 | 0.158333 | 1.596142857 | 0.002778 | 0.0018 | -0.0059 | 2.13 | 7.903857 | 16.84112 | 9.953378 | 16.84111571 |
| 9:09:36 | 580 | 0.161111 | 1.597942857 | 0.002778 | 0.014514 | -0.0081 | 2.13 | 7.902057 | 16.83948 | 9.952412 | 16.83948171 |
| 9:09:46 | 590 | 0.163889 | 1.612457143 | 0.002778 | -0.00943 | -0.001 | 2.13 | 7.887543 | 16.80147 | 9.929945 | 16.80146629 |
| 9:09:56 | 600 | 0.166667 | 1.603028571 | 0.002778 | -0.01134 | -0.0241 | 2.13 | 7.896971 | 16.84465 | 9.955466 | 16.84464914 |
| 9:10:06 | 610 | 0.169444 | 1.591685714 | 0.002778 | -0.0282 | 0.0045 | 2.13 | 7.908314 | 16.84021 | 9.952842 | 16.84020943 |
| 9:10:16 | 620 | 0.172222 | 1.563485714 | 0.002778 | -0.02574 | 0.0314 | 2.13 | 7.936514 | 16.87338 | 9.972444 | 16.87337543 |



ANNEX 6.2

Calculation of nitrifying and denitrifying bacteria based on nitrification and denitrification rates.

For nitrifying bacteria:

- Ammonium oxidizing bacteria:

$$r_{\text{NH-NO}_2} = - \left(i_{\text{XB}} + \frac{1}{Y_{\text{NS}}} \right) \left(\hat{\mu}_{\text{NS}} \cdot \frac{S_{\text{O}}}{K_{\text{A_O}} + S_{\text{O}}} \cdot \frac{S_{\text{NH}}}{K_{\text{A_NH}} + S_{\text{NH}}} \cdot \frac{S_{\text{AKL}}}{K_{\text{A_AKL}} + S_{\text{AKL}}} \cdot \text{fpH} - b_{\text{A}} \right)$$

$$\bullet X_{\text{A_NS}} = ([\text{NH}_4\text{_beginning_nitrification}] - [\text{NH}_4\text{_end_nitrification}]) * 24 / 5$$

(Eq. 6.15)

- Nitrite oxidizing bacteria:

$$r_{\text{NO}_2\text{-NO}_3} = - \left(i_{\text{XB}} + \frac{1}{Y_{\text{NB}}} \right) \left(\hat{\mu}_{\text{NB}} \cdot \frac{S_{\text{O}}}{K_{\text{A_O}} + S_{\text{O}}} \cdot \frac{S_{\text{NO}_2}}{K_{\text{A_NO}_2} + S_{\text{NO}_2}} \cdot \frac{S_{\text{AKL}}}{K_{\text{A_AKL}} + S_{\text{AKL}}} \cdot \text{fpH} - b_{\text{A}} \right)$$

$$\bullet X_{\text{A_NB}} = ([\text{NO}_2\text{_beginning_nitrification}] - [\text{NO}_2\text{_end_nitrification}]) * 24 / 5$$

(Eq. 6.16)

For denitrifying bacteria

- Nitrite denitrifying bacteria:

$$r_{\text{v,NO}_2} = \left(\frac{1 - Y_{\text{H}}}{1.71 Y_{\text{H}}} \right) \left(\hat{\mu}_{\text{H}} \cdot \frac{S_{\text{COD}}}{K_{\text{COD}} + S_{\text{COD}}} \cdot \frac{S_{\text{NO}_2}}{K_{\text{NO}_2} + S_{\text{NO}_2}} \cdot \frac{K_{\text{OH}}}{S_{\text{O}} + K_{\text{OH}}} - b_{\text{H}} \right) \eta_{\text{g}} X_{\text{H_NO}_2} =$$

$$([\text{NO}_2\text{_beginning_of_denitrification}] - [\text{NO}_2\text{_end_of_denitrification}]) * 24 / 5$$

(Eq. 6.17)

- Nitrate denitrifying bacteria:

$$r_{\text{v,NO}_3} = \left(\frac{1 - Y_{\text{H}}}{2.86 Y_{\text{H}}} \right) \left(\hat{\mu}_{\text{H}} \cdot \frac{S_{\text{COD}}}{K_{\text{COD}} + S_{\text{COD}}} \cdot \frac{S_{\text{NO}_3}}{K_{\text{NO}_3} + S_{\text{NO}_3}} \cdot \frac{K_{\text{OH}}}{S_{\text{O}} + K_{\text{OH}}} - b_{\text{H}} \right) \eta_{\text{g}} X_{\text{H_NO}_3} =$$

$$([\text{NO}_3\text{_beginning_of_denitrification}] - [\text{NO}_3\text{_end_of_denitrification}]) * 24 / 5$$

(Eq. 6.18)

ANNEX 9
CALIBRATION AND VALIDATION
SCENARIO ANALYSIS

| Calibration (no Carbon) Long term evolution (SBR_Outlet) | | | | | | | |
|--|----------|----------|----------|------|------|------|-----|
| Time (day) | Sim | | | Exp | | | COD |
| | NH4 | NO2 | NO3 | NH4 | NO2 | NO3 | |
| 1 | 168.4534 | 43.69799 | 16.43896 | 180 | 39 | 14.1 | 390 |
| 2 | 226.6337 | 55.94919 | 18.56526 | 247 | 52 | 17.9 | 391 |
| 3 | 222.1946 | 64.84405 | 19.02292 | | | | |
| 4 | 212.163 | 74.76662 | 19.56589 | | | | |
| 5 | 201.4304 | 85.23536 | 19.93005 | 203 | 95.7 | 12.8 | 356 |
| 6 | 190.4349 | 96.07098 | 20.07217 | 192 | 101 | 17.1 | 345 |
| 7 | 179.2279 | 107.2111 | 20.01862 | 179 | 122 | 18.2 | 374 |
| 8 | 167.8282 | 118.6168 | 19.80395 | 181 | 120 | 11.5 | 392 |
| 9 | 156.253 | 130.2532 | 19.45929 | 160 | 153 | 9.7 | 431 |
| 10 | 144.5203 | 142.0879 | 19.01125 | | | | |
| 11 | 132.649 | 154.0893 | 18.48222 | | | | |
| 12 | 120.6575 | 166.2285 | 17.89122 | 99 | 191 | 17.4 | 332 |
| 13 | 108.5639 | 178.4785 | 17.25431 | 115 | 192 | 13.3 | 397 |
| 14 | 96.3856 | 190.8143 | 16.58522 | 109 | 205 | 19.5 | 289 |
| 15 | 84.13956 | 203.2125 | 15.89578 | 78 | 220 | 20.3 | |
| 16 | 71.84198 | 215.6514 | 15.19651 | 70 | 235 | 15.2 | 322 |
| 17 | 59.51035 | 228.1085 | 14.49715 | | | | |
| 18 | 47.16458 | 240.5589 | 13.80773 | | | | |
| 19 | 34.83271 | 252.9685 | 13.1406 | 42 | 256 | 14.2 | 321 |
| 20 | 22.56627 | 265.2757 | 12.51649 | 19 | 281 | 18.5 | 352 |
| 21 | 10.51692 | 277.302 | 11.99391 | 8.5 | 288 | 17.9 | 394 |
| 22 | 0.587282 | 286.9564 | 12.61516 | 4 | 291 | 16.8 | 401 |
| 23 | 0.406936 | 284.6364 | 16.96184 | 1 | 298 | 21.9 | 442 |
| 24 | 0.402528 | 283.5279 | 18.03839 | | | | |
| 25 | 0.399926 | 282.6536 | 18.73179 | | | | |
| 26 | 0.397494 | 281.8395 | 19.38481 | 0.49 | 283 | 26.7 | 560 |
| 27 | 0.395534 | 281.0666 | 20.02528 | 0.5 | 281 | 26.8 | 556 |
| 28 | 0.393804 | 280.3298 | 20.65538 | 0.2 | 293 | 29.8 | 567 |
| 29 | 0.392242 | 279.6255 | 21.27561 | 0.4 | 281 | 31.7 | 582 |
| 30 | 0.390969 | 278.9499 | 21.88657 | 0.43 | 279 | 33.2 | 564 |
| | | | | 0.54 | 292 | 34.2 | |

| Calibration No Carbon Cycle evolution Nutrient | | | | | | | | | | |
|--|----|--------------|---------------|---------------|------|-------|------|-------|------|-----|
| Time | d | Sim | | | Exp | | | | | |
| | | S_NH mg/L | S_NO2 mg/L | S_NO3 mg/L | pH | CaCO3 | NH4 | NO2 | NO3 | COD |
| 16 | | 65.68 | 221.9 | 14.85 | | | | | | |
| 16.01 | 0 | 247.1 | 69.18 | 4.051 | 8.5 | 1860 | 261 | 65.2 | 0.41 | 308 |
| 16.02 | | 240.4 | 74.05 | 3.685 | | | | | | |
| 16.03 | | 233.4 | 79.2 | 3.478 | | | | | | |
| 16.04 | | 225.5 | 85.9 | 3.966 | | | | | | |
| 16.05 | | 217.6 | 92.76 | 4.513 | 8.43 | 1840 | 230 | 98.7 | 3.2 | 322 |
| 16.06 | | 209.9 | 99.37 | 5.046 | | | | | | |
| 16.07 | | 202.1 | 106.1 | 5.597 | | | | | | |
| 16.08 | | 194.2 | 113 | 6.163 | | | | | | |
| 16.09 | 2 | 186.3 | 119.9 | 6.74 | 8.39 | 1800 | 212 | 134.6 | 5.9 | 343 |
| 16.1 | | 178.4 | 126.8 | 7.326 | | | | | | |
| 16.11 | | 170.5 | 133.8 | 7.915 | | | | | | |
| 16.12 | | 162.6 | 140.7 | 8.504 | | | | | | |
| 16.13 | | 154.5 | 147.8 | 9.121 | 8.34 | 1650 | 175 | 172 | 8.8 | 355 |
| 16.14 | | 146.9 | 154.5 | 9.701 | | | | | | |
| 16.15 | | 138.7 | 161.8 | 10.33 | | | | | | |
| 16.16 | | 130.8 | 168.9 | 10.95 | | | | | | |
| 16.17 | 4 | 123 | 175.8 | 11.56 | 8.28 | 1580 | 128 | 198 | 11.2 | 371 |
| 16.18 | | 115.1 | 182.8 | 12.18 | | | | | | |
| 16.19 | | 107.1 | 189.9 | 12.81 | | | | | | |
| 16.2 | | 99.15 | 197 | 13.45 | | | | | | |
| 16.21 | | 91.15 | 204.1 | 14.09 | 8.21 | 1420 | 115 | 219 | 12.6 | 378 |
| 16.22 | | 83.2 | 211.2 | 14.73 | | | | | | |
| 16.23 | | 75.34 | 218.2 | 15.37 | | | | | | |
| 16.24 | | 67.34 | 225.4 | 16.03 | | | | | | |
| 16.25 | 6 | 59.55 | 232.3 | 16.67 | 8.16 | 1300 | 70 | 235 | 15.2 | 402 |
| 16.26 | | 59.34 | 232 | 16.4 | | | | | | |
| 16.27 | | 59.35 | 231.4 | 16.1 | | | | | | |
| 16.28 | | 59.38 | 230.8 | 15.83 | | | | | | |
| 16.29 | | 59.4 | 230.3 | 15.57 | | | | | | |
| 16.3 | | 59.42 | 229.8 | 15.31 | 8.2 | 1370 | 71.1 | 227 | 17.1 | 397 |
| 16.31 | | 59.45 | 229.2 | 15.05 | | | | | | |
| 16.32 | | 59.47 | 228.7 | 14.81 | | | | | | |
| 16.33 | | 59.5 | 228.2 | 14.56 | | | | | | |
| 16.34 | 8 | 59.51 | 228.1 | 14.5 | 8.24 | 1420 | 69.7 | 224 | 19 | 392 |
| 16.35 | | 59.51 | 228.1 | 14.5 | | | | | | |
| 16.36 | | 59.51 | 228.1 | 14.5 | | | | | | |
| 16.37 | | 59.51 | 228.1 | 14.5 | | | | | | |
| 16.38 | | 59.51 | 228.1 | 14.5 | 0 | 0 | 67.8 | 223 | 14.8 | 393 |
| 16.39 | | 59.51 | 228.1 | 14.5 | | | | | | |
| 16.4 | | 59.51 | 228.1 | 14.5 | | | | | | |
| 16.41 | | 59.51 | 228.1 | 14.5 | | | | | | |
| 16.42 | 10 | 59.51 | 228.1 | 14.5 | 0 | 0 | 70 | 222 | 14.8 | 392 |
| 16.43 | | 59.51 | 228.1 | 14.5 | | | | | | |
| 16.44 | | 59.51 | 228.1 | 14.5 | | | | | | |
| 16.45 | | 59.51 | 228.1 | 14.5 | | | | | | |
| 16.46 | | 59.51 | 228.1 | 14.5 | 0 | 0 | 69 | 223 | 14.8 | 391 |
| 16.47 | | 59.51 | 228.1 | 14.5 | | | | | | |
| 16.48 | | 59.51 | 228.1 | 14.5 | | | | | | |
| | | Sim | | | Exp | | | | | |

| Time | | S_NH | S_NO2 | S_NO3 | pH | CaCO3 | NH4 | NO2 | NO3 | COD |
|-------|----|-------|-------|-------|------|-------|------|------|------|-----|
| d | | mg/L | mg/L | mg/L | | | | | | |
| 21 | | 4.79 | 283 | 11.86 | | | | | | |
| 21.01 | | 228.2 | 87.94 | 2.957 | 8.53 | 1700 | 229 | 92.6 | 0.21 | 327 |
| 21.02 | | 219.6 | 94.6 | 2.45 | | | | | | |
| 21.03 | | 211 | 101.4 | 2.122 | | | | | | |
| 21.04 | | 201.4 | 109.9 | 2.508 | | | | | | |
| 21.05 | | 191.8 | 118.4 | 2.953 | 8.62 | 1360 | 197 | 119 | 4.7 | 352 |
| 21.06 | | 182.2 | 127 | 3.411 | | | | | | |
| 21.07 | | 172.5 | 135.6 | 3.874 | | | | | | |
| 21.08 | | 162.6 | 144.5 | 4.359 | | | | | | |
| 21.09 | 2 | 152.9 | 153.3 | 4.843 | 8.4 | 1200 | 147 | 178 | 14.7 | 388 |
| 21.1 | | 143.4 | 161.9 | 5.324 | | | | | | |
| 21.11 | | 133.8 | 170.6 | 5.816 | | | | | | |
| 21.12 | | 124.1 | 179.4 | 6.317 | | | | | | |
| 21.13 | | 114.4 | 188.1 | 6.823 | 8.26 | 940 | 93 | 209 | 8.5 | 405 |
| 21.14 | | 104.5 | 197.1 | 7.349 | | | | | | |
| 21.15 | | 94.79 | 206 | 7.872 | | | | | | |
| 21.16 | | 85.24 | 214.7 | 8.391 | | | | | | |
| 21.17 | 4 | 75.41 | 223.7 | 8.931 | 8.09 | 740 | 58.5 | 265 | 11.1 | 412 |
| 21.18 | | 65.7 | 232.6 | 9.472 | | | | | | |
| 21.19 | | 55.98 | 241.5 | 10.02 | | | | | | |
| 21.2 | | 46.42 | 250.2 | 10.57 | | | | | | |
| 21.21 | | 36.63 | 259.1 | 11.15 | 7.92 | 560 | 34.4 | 298 | 15.6 | 423 |
| 21.22 | | 26.98 | 268 | 11.73 | | | | | | |
| 21.23 | | 17.48 | 276.6 | 12.34 | | | | | | |
| 21.24 | | 8.135 | 285.1 | 13.03 | | | | | | |
| 21.25 | 6 | 0.707 | 291.4 | 13.99 | 8.39 | 540 | 8.3 | 311 | 19 | 437 |
| 21.26 | | 0.162 | 291.3 | 14.34 | | | | | | |
| 21.27 | | 0.222 | 290.7 | 14.09 | | | | | | |
| 21.28 | | 0.284 | 290 | 13.83 | | | | | | |
| 21.29 | | 0.342 | 289.4 | 13.59 | | | | | | |
| 21.3 | | 0.4 | 288.8 | 13.36 | 8.33 | 500 | 8.6 | 302 | 13.6 | 412 |
| 21.31 | | 0.458 | 288.2 | 13.13 | | | | | | |
| 21.32 | | 0.516 | 287.7 | 12.9 | | | | | | |
| 21.33 | | 0.57 | 287.1 | 12.68 | | | | | | |
| 21.34 | 8 | 0.587 | 287 | 12.62 | 8.2 | 440 | 8.1 | 291 | 15.7 | 401 |
| 21.35 | | 0.587 | 287 | 12.62 | | | | | | |
| 21.36 | | 0.587 | 287 | 12.62 | | | | | | |
| 21.37 | | 0.587 | 287 | 12.62 | | | | | | |
| 21.38 | | 0.587 | 287 | 12.62 | 0 | 440 | 8.5 | 289 | 12.5 | 405 |
| 21.39 | | 0.587 | 287 | 12.62 | | | | | | |
| 21.4 | | 0.587 | 287 | 12.62 | | | | | | |
| 21.41 | | 0.587 | 287 | 12.62 | | | | | | |
| 21.42 | 10 | 0.587 | 287 | 12.62 | 0 | 440 | 8 | 288 | 11.8 | 407 |
| 21.43 | | 0.587 | 287 | 12.62 | | | | | | |
| 21.44 | | 0.587 | 287 | 12.62 | | | | | | |
| 21.45 | | 0.587 | 287 | 12.62 | | | | | | |
| 21.46 | | 0.587 | 287 | 12.62 | 0 | 440 | 8.3 | 289 | 11.8 | 402 |
| 21.47 | | 0.587 | 287 | 12.62 | | | | | | |
| 21.48 | | 0.587 | 287 | 12.62 | | | | | | |
| 21.49 | | 0.587 | 287 | 12.62 | | | | | | |
| 21.5 | 12 | 0.587 | 287 | 12.62 | | | | | | |
| | | Sim | | | Exp | | | | | |
| Time | | S_NH | S_NO2 | S_NO3 | pH | CaCO3 | NH4 | NO2 | NO3 | COD |

| d | | mg/L | mg/L | mg/L | | | | | | |
|-------|----|-------|-------|-------|------|------|------|------|------|-----|
| 28 | | 0.393 | 280 | 20.97 | | | | | | |
| 28.01 | | 225.2 | 88.75 | 5.364 | 8.5 | 1640 | 231 | 97.9 | 3.31 | 323 |
| 28.02 | | 214 | 97.87 | 4.765 | | | | | | |
| 28.03 | | 203 | 107 | 4.302 | | | | | | |
| 28.04 | | 190.7 | 118 | 4.566 | | | | | | |
| 28.05 | | 178.8 | 128.9 | 4.929 | 8.57 | 1310 | 161 | 121 | 4.7 | 344 |
| 28.06 | | 166.7 | 140 | 5.31 | | | | | | |
| 28.07 | | 154.5 | 151.1 | 5.702 | | | | | | |
| 28.08 | | 142.4 | 162.3 | 6.104 | | | | | | |
| 28.09 | 2 | 130 | 173.7 | 6.522 | 8.34 | 1150 | 123 | 173 | 6.8 | 362 |
| 28.1 | | 117.9 | 184.9 | 6.942 | | | | | | |
| 28.11 | | 106 | 195.8 | 7.359 | | | | | | |
| 28.12 | | 93.65 | 207.3 | 7.803 | | | | | | |
| 28.13 | | 81.54 | 218.5 | 8.246 | 8.23 | 890 | 69 | 243 | 8.5 | 371 |
| 28.14 | | 69.33 | 229.8 | 8.701 | | | | | | |
| 28.15 | | 57.24 | 241.1 | 9.162 | | | | | | |
| 28.16 | | 45.15 | 252.3 | 9.634 | | | | | | |
| 28.17 | 4 | 32.96 | 263.7 | 10.13 | 8.03 | 740 | 48.5 | 286 | 11.1 | 401 |
| 28.18 | | 20.94 | 274.8 | 10.64 | | | | | | |
| 28.19 | | 9.137 | 285.8 | 11.22 | | | | | | |
| 28.2 | | 0.254 | 293.6 | 12.14 | | | | | | |
| 28.21 | | 0.011 | 292.3 | 13.71 | 7.71 | 540 | 4.1 | 307 | 18.8 | 437 |
| 28.22 | | 0.011 | 290.8 | 15.31 | | | | | | |
| 28.23 | | 0.011 | 289.3 | 16.88 | | | | | | |
| 28.24 | | 0.011 | 287.8 | 18.46 | | | | | | |
| 28.25 | 6 | 0.011 | 286.4 | 19.97 | 8.28 | 500 | 1 | 301 | 42.7 | 462 |
| 28.26 | | 0.012 | 284.9 | 21.45 | | | | | | |
| 28.27 | | 0.019 | 283.9 | 22.53 | | | | | | |
| 28.28 | | 0.069 | 283.2 | 22.59 | | | | | | |
| 28.29 | | 0.135 | 282.5 | 22.33 | | | | | | |
| 28.3 | | 0.195 | 281.8 | 22.08 | 8.36 | 500 | 1.1 | 298 | 35.2 | 441 |
| 28.31 | | 0.256 | 281.1 | 21.82 | | | | | | |
| 28.32 | | 0.315 | 280.5 | 21.59 | | | | | | |
| 28.33 | | 0.376 | 279.8 | 21.34 | | | | | | |
| 28.34 | 8 | 0.392 | 279.6 | 21.28 | 8.34 | 460 | 1 | 292 | 29.7 | 436 |
| 28.35 | | 0.392 | 279.6 | 21.28 | | | | | | |
| 28.36 | | 0.392 | 279.6 | 21.28 | | | | | | |
| 28.37 | | 0.392 | 279.6 | 21.28 | | | | | | |
| 28.38 | | 0.392 | 279.6 | 21.28 | 0 | 460 | 0.8 | 293 | 29.2 | 439 |
| 28.39 | | 0.392 | 279.6 | 21.28 | | | | | | |
| 28.4 | | 0.392 | 279.6 | 21.28 | | | | | | |
| 28.41 | | 0.392 | 279.6 | 21.28 | | | | | | |
| 28.42 | 10 | 0.392 | 279.6 | 21.28 | 0 | 460 | 0.7 | 294 | 29.3 | 441 |
| 28.43 | | 0.392 | 279.6 | 21.28 | | | | | | |
| 28.44 | | 0.392 | 279.6 | 21.28 | | | | | | |
| 28.45 | | 0.392 | 279.6 | 21.28 | | | | | | |
| 28.46 | | 0.392 | 279.6 | 21.28 | 0 | 460 | 0.2 | 293 | 29.8 | 442 |
| 28.47 | | 0.392 | 279.6 | 21.28 | | | | | | |
| 28.48 | | 0.392 | 279.6 | 21.28 | | | | | | |
| 28.49 | | 0.392 | 279.6 | 21.28 | | | | | | |
| 28.5 | 12 | 0.392 | 279.6 | 21.28 | | | | | | |

| Calibration No Carbon Cycle Evolution DO | | | | | | | | | | | |
|--|-----------|----------|-----------|----------|-----------|----------|-----------|----------|-----------|----------|-----------|
| Experiment | | | | | | | | | | | |
| Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) |
| 0 | | 0.917 | 0.52 | 1.833 | 0.81 | 2.75 | 0.47 | 3.667 | 0.74 | 4.633 | 0.6 |
| 0.017 | 7.96 | 0.933 | 0.53 | 1.85 | 0.62 | 2.767 | 0.57 | 3.683 | 0.44 | 4.65 | 0.72 |
| 0.033 | 8.13 | 0.95 | 0.77 | 1.867 | 0.63 | 2.783 | 0.55 | 3.7 | 0.55 | 4.667 | 0.62 |
| 0.05 | 8.17 | 0.967 | 0.69 | 1.883 | 0.67 | 2.8 | 0.75 | 3.717 | 0.5 | 4.683 | 0.62 |
| 0.067 | 4.51 | 0.983 | 0.63 | 1.9 | 0.92 | 2.817 | 0.44 | 3.733 | 0.56 | 4.7 | 0.55 |
| 0.083 | 1.9 | 1 | 0.76 | 1.917 | 0.81 | 2.833 | 0.47 | 3.75 | 0.48 | 4.717 | 0.78 |
| 0.1 | 0.86 | 1.017 | 0.65 | 1.933 | 0.7 | 2.85 | 0.69 | 3.767 | 0.73 | 4.733 | 0.63 |
| 0.117 | 0.81 | 1.033 | 0.57 | 1.95 | 0.98 | 2.867 | 0.58 | 3.783 | 0.55 | 4.75 | 0.62 |
| 0.133 | 0.9 | 1.05 | 0.54 | 1.967 | 0.64 | 2.883 | 0.49 | 3.8 | 0.58 | 4.767 | 0.72 |
| 0.15 | 0.71 | 1.067 | 0.7 | 1.983 | 1.02 | 2.9 | 0.65 | 3.817 | 0.56 | 4.783 | 0.65 |
| 0.167 | 0.65 | 1.083 | 0.52 | 2 | 0.68 | 2.917 | 0.68 | 3.833 | 0.56 | 4.8 | 0.63 |
| 0.183 | 0.69 | 1.1 | 0.71 | 2.017 | 0.82 | 2.933 | 0.53 | 3.85 | 0.57 | 4.817 | 0.55 |
| 0.2 | 0.73 | 1.117 | 0.7 | 2.033 | 0.67 | 2.95 | 0.53 | 3.867 | 0.61 | 4.833 | 0.75 |
| 0.217 | 0.65 | 1.133 | 0.63 | 2.05 | 0.63 | 2.967 | 0.61 | 3.883 | 0.49 | 4.85 | 0.74 |
| 0.233 | 0.93 | 1.15 | 0.74 | 2.067 | 0.64 | 2.983 | 0.68 | 3.9 | 0.51 | 4.867 | 0.54 |
| 0.25 | 0.87 | 1.167 | 0.68 | 2.083 | 1.04 | 3 | 0.49 | 3.917 | 1.02 | 4.883 | 0.48 |
| 0.267 | 0.69 | 1.183 | 0.7 | 2.1 | 0.6 | 3.017 | 0.59 | 3.933 | 0.72 | 4.9 | 0.62 |
| 0.283 | 0.78 | 1.2 | 0.63 | 2.117 | 0.85 | 3.033 | 0.53 | 3.95 | 0.63 | 4.917 | 0.61 |
| 0.3 | 0.66 | 1.217 | 0.98 | 2.133 | 0.6 | 3.05 | 0.52 | 3.967 | 0.57 | 4.933 | 0.53 |
| 0.317 | 0.82 | 1.233 | 0.73 | 2.15 | 0.82 | 3.067 | 0.57 | 3.983 | 0.64 | 4.95 | 0.52 |
| 0.333 | 1.18 | 1.25 | 0.68 | 2.167 | 0.62 | 3.083 | 0.56 | 4 | 0.56 | 4.967 | 0.66 |
| 0.35 | 0.93 | 1.267 | 0.55 | 2.183 | 0.59 | 3.1 | 0.6 | 4.017 | 0.59 | 4.983 | 0.63 |
| 0.367 | 0.96 | 1.283 | 0.75 | 2.2 | 0.59 | 3.117 | 0.55 | 4.033 | 0.48 | 5 | 0.53 |
| 0.383 | 1.04 | 1.3 | 0.59 | 2.217 | 0.69 | 3.133 | 0.64 | 4.05 | 0.53 | 5.017 | 0.52 |
| 0.4 | 0.95 | 1.317 | 0.65 | 2.233 | 0.69 | 3.15 | 0.52 | 4.067 | 0.58 | 5.033 | 0.65 |
| 0.417 | 0.81 | 1.333 | 0.63 | 2.25 | 0.66 | 3.167 | 0.48 | 4.083 | 0.54 | 5.05 | 0.68 |
| 0.433 | 0.82 | 1.35 | 0.63 | 2.267 | 0.74 | 3.183 | 0.68 | 4.1 | 0.74 | 5.067 | 0.61 |
| 0.45 | 0.87 | 1.367 | 0.84 | 2.283 | 0.59 | 3.2 | 0.53 | 4.117 | 0.57 | 5.083 | 0.55 |
| 0.467 | 0.74 | 1.383 | 0.71 | 2.3 | 0.84 | 3.217 | 0.52 | 4.133 | 0.49 | 5.1 | 0.7 |
| 0.483 | 0.77 | 1.4 | 0.58 | 2.317 | 0.77 | 3.233 | 0.56 | 4.15 | 0.43 | 5.117 | 0.64 |
| 0.5 | 0.86 | 1.417 | 0.86 | 2.333 | 0.65 | 3.25 | 0.75 | 4.167 | 0.56 | 5.133 | 0.87 |
| 0.517 | 0.62 | 1.433 | 1.14 | 2.35 | 0.53 | 3.267 | 0.62 | 4.183 | 0.55 | 5.15 | 0.52 |
| 0.533 | 0.72 | 1.45 | 0.74 | 2.367 | 0.86 | 3.283 | 0.82 | 4.2 | 0.6 | 5.167 | 0.54 |
| 0.55 | 0.81 | 1.467 | 0.62 | 2.383 | 0.6 | 3.3 | 0.51 | 4.217 | 0.68 | 5.183 | 0.81 |
| 0.567 | 0.71 | 1.483 | 0.88 | 2.4 | 0.64 | 3.317 | 0.55 | 4.233 | 0.68 | 5.2 | 0.6 |
| 0.583 | 0.67 | 1.5 | 0.63 | 2.417 | 0.6 | 3.333 | 0.64 | 4.25 | 0.69 | 5.217 | 0.47 |
| 0.6 | 0.66 | 1.517 | 0.65 | 2.433 | 0.99 | 3.35 | 0.54 | 4.267 | 0.75 | 5.233 | 0.61 |
| 0.617 | 0.77 | 1.533 | 0.56 | 2.45 | 0.55 | 3.367 | 0.5 | 4.283 | 0.61 | 5.25 | 0.98 |
| 0.633 | 0.69 | 1.55 | 0.7 | 2.467 | 0.97 | 3.383 | 0.67 | 4.3 | 0.55 | 5.267 | 0.6 |
| 0.65 | 1.34 | 1.567 | 0.67 | 2.483 | 0.6 | 3.4 | 0.62 | 4.317 | 0.48 | 5.283 | 0.5 |
| 0.667 | 0.6 | 1.583 | 0.77 | 2.5 | 0.81 | 3.417 | 0.63 | 4.333 | 0.48 | 5.3 | 0.55 |
| 0.683 | 0.63 | 1.6 | 0.84 | 2.517 | 0.72 | 3.433 | 0.71 | 4.35 | 0.76 | 5.317 | 0.68 |
| 0.7 | 0.77 | 1.617 | 0.77 | 2.533 | 0.49 | 3.45 | 0.63 | 4.367 | 0.82 | 5.333 | 0.63 |
| 0.717 | 0.58 | 1.633 | 0.64 | 2.55 | 0.73 | 3.467 | 0.58 | 4.383 | 0.87 | 5.35 | 0.88 |
| 0.733 | 0.85 | 1.65 | 0.7 | 2.567 | 0.53 | 3.483 | 0.57 | 4.4 | 0.66 | 5.367 | 0.91 |
| 0.75 | 0.64 | 1.667 | 0.58 | 2.583 | 0.61 | 3.5 | 0.59 | 4.417 | 0.68 | 5.383 | 0.75 |
| 0.767 | 0.64 | 1.683 | 0.63 | 2.6 | 0.63 | 3.517 | 0.44 | 4.433 | 0.68 | 5.4 | 0.77 |
| 0.783 | 0.73 | 1.7 | 0.68 | 2.617 | 0.52 | 3.533 | 0.78 | 4.45 | 0.75 | 5.417 | 0.78 |
| 0.8 | 0.78 | 1.717 | 0.58 | 2.633 | 0.53 | 3.55 | 0.63 | 4.467 | 0.6 | 5.433 | 0.82 |
| 0.817 | 0.9 | 1.733 | 0.68 | 2.65 | 0.51 | 3.567 | 0.61 | 4.483 | 0.71 | 5.45 | 0.67 |
| 0.833 | 0.57 | 1.75 | 0.69 | 2.667 | 0.54 | 3.583 | 0.46 | 4.5 | 0.66 | 5.467 | 0.59 |
| 0.85 | 0.5 | 1.767 | 0.63 | 2.683 | 0.53 | 3.6 | 0.49 | 4.517 | 0.71 | 5.483 | 0.73 |
| 0.867 | 0.82 | 1.783 | 0.72 | 2.7 | 0.71 | 3.617 | 0.72 | 4.533 | 0.58 | 5.5 | 0.8 |

| Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) |
|----------|-----------|----------|-----------|----------|-----------|----------|-----------|----------|-----------|----------|-----------|
| 5.6 | 0.9 | 5.55 | 0.56 | 9.467 | 0.06 | 10.43 | 0.06 | 11.4 | | 0.35 | 1.08 |
| 5.617 | 1 | 5.567 | 0.57 | 9.483 | 0.06 | 10.45 | 0.06 | 11.42 | | 0.367 | 0.94 |
| 5.633 | 0.85 | 5.583 | 0.97 | 9.5 | 0.06 | 10.47 | 0.06 | 11.43 | | 0.383 | 0.98 |
| 5.65 | 0.05 | 8.5 | 0.05 | 9.517 | 0.05 | 10.48 | 0.06 | 11.45 | | 0.4 | 0.88 |
| 5.667 | 0.05 | 8.517 | 0.05 | 9.533 | 0.05 | 10.5 | 0.06 | 11.47 | | 0.417 | 0.83 |
| 5.683 | 0.05 | 8.533 | 0.06 | 9.55 | 0.06 | 10.52 | 0.06 | 11.48 | | 0.433 | 0.73 |
| 5.7 | 0.06 | 8.55 | 0.06 | 9.567 | 0.05 | 10.53 | 0.06 | 11.5 | | 0.45 | 1.02 |
| 5.717 | 0.05 | 8.567 | 0.06 | 9.583 | 0.05 | 10.55 | 0.06 | 11.52 | | 0.467 | 0.87 |
| 5.733 | 0.06 | 8.583 | 0.05 | 9.6 | 0.06 | 10.57 | 0.06 | 11.53 | | 0.483 | 0.78 |
| 5.75 | 0.05 | 8.6 | 0.05 | 9.617 | 0.06 | 10.58 | 0.05 | 11.55 | | 0.5 | 0.8 |
| 5.767 | 0.06 | 8.617 | 0.05 | 9.633 | 0.06 | 10.6 | 0.05 | 11.57 | | 0.517 | 0.81 |
| 5.783 | 0.06 | 8.633 | 0.05 | 9.65 | 0.05 | 10.62 | 0.06 | 11.58 | | 0.533 | 0.97 |
| 5.8 | 0.06 | 8.65 | 0.05 | 9.667 | 0.05 | 10.63 | 0.05 | 11.6 | | 0.55 | 0.74 |
| 5.817 | 0.07 | 8.667 | 0.06 | 9.683 | 0.05 | 10.65 | 0.05 | 11.62 | | 0.567 | 0.81 |
| 5.833 | 0.07 | 8.683 | 0.05 | 9.7 | 0.05 | 10.67 | 0.06 | 11.63 | | 0.583 | 0.93 |
| 5.85 | 0.07 | 8.7 | 0.05 | 9.717 | 0.05 | 10.68 | 0.06 | 11.65 | | 0.6 | 0.85 |
| 5.867 | 0.07 | 8.717 | 0.05 | 9.733 | 0.06 | 10.7 | 0.06 | 11.67 | | 0.617 | 0.78 |
| 5.883 | 0.05 | 8.733 | 0.06 | 9.75 | 0.05 | 10.72 | 0.05 | 11.68 | | 0.633 | 0.8 |
| 5.9 | 0.05 | 8.75 | 0.05 | 9.767 | 0.05 | 10.73 | 0.05 | 11.7 | | 0.65 | 0.86 |
| 5.917 | 0.06 | 8.767 | 0.05 | 9.783 | 0.05 | 10.75 | 0.05 | 11.72 | | 0.667 | 0.83 |
| 5.933 | 0.05 | 8.783 | 0.05 | 9.8 | 0.06 | 10.77 | 0.05 | 11.73 | | 0.683 | 0.73 |
| 5.95 | 0.05 | 8.8 | 0.05 | 9.817 | 0.05 | 10.78 | 0.05 | 11.75 | | 0.7 | 0.74 |
| 5.967 | 0.06 | 8.817 | 0.06 | 9.833 | 0.05 | 10.8 | 0.06 | 11.77 | | 0.717 | 0.75 |
| 5.983 | 0.06 | 8.833 | 0.06 | 9.85 | 0.05 | 10.82 | 0.05 | 11.78 | | 0.733 | 0.79 |
| 6 | 0.06 | 8.85 | 0.06 | 9.867 | 0.05 | 10.83 | 0.05 | 11.8 | | 0.75 | 1.09 |
| 6.017 | 0.05 | 8.867 | 0.06 | 9.883 | 0.06 | 10.85 | 0.05 | 11.82 | | 0.767 | 0.78 |
| 6.033 | 0.06 | 8.883 | 0.06 | 9.9 | 0.06 | 10.87 | | 11.83 | | 0.783 | 0.78 |
| 6.05 | 0.06 | 8.9 | 0.06 | 9.917 | 0.06 | 10.88 | | 11.85 | | 0.8 | 0.78 |
| 6.067 | 0.05 | 8.917 | 0.06 | 9.933 | 0.06 | 10.9 | | 11.87 | | 0.817 | 0.76 |
| 6.083 | 0.05 | 8.933 | 0.06 | 9.95 | 0.06 | 10.92 | | 11.88 | | 0.833 | 0.85 |
| 6.1 | 0.05 | 8.95 | 0.06 | 9.967 | 0.06 | 10.93 | | 11.9 | | 0.85 | 1.26 |
| 6.117 | 0.05 | 8.967 | 0.06 | 9.983 | 0.06 | 10.95 | | 11.92 | | 0.867 | 0.92 |
| 6.133 | 0.05 | 8.983 | 0.05 | 10 | 0.06 | 10.97 | | 11.93 | | 0.883 | 0.91 |
| 6.15 | 0.06 | 9 | 0.05 | 10.02 | 0.06 | 10.98 | | 11.95 | | 0.9 | 0.77 |
| 6.167 | 0.05 | 9.017 | 0.06 | 10.03 | 0.06 | 11 | | 11.97 | | 0.917 | 0.72 |
| 6.183 | 0.05 | 9.033 | 0.05 | 10.05 | 0.05 | 11.02 | | 11.98 | | 0.933 | 0.95 |
| 6.2 | 0.05 | 9.05 | 0.05 | 10.07 | 0.05 | 11.03 | | 12 | | 0.95 | 0.81 |
| 6.217 | 0.05 | 9.067 | 0.06 | 10.08 | 0.06 | 11.05 | | 0 | 1.54 | 0.967 | 0.72 |
| 6.233 | 0.05 | 9.083 | 0.06 | 10.1 | 0.05 | 11.07 | | 0.017 | 9.09 | 0.983 | 0.83 |
| 6.25 | 0.06 | 9.1 | 0.06 | 10.12 | 0.05 | 11.08 | | 0.033 | 8.94 | 1 | 0.77 |
| 6.267 | 0.05 | 9.117 | 0.05 | 10.13 | 0.06 | 11.1 | | 0.05 | 7.66 | 1.017 | 0.7 |
| 6.283 | 0.05 | 9.133 | 0.05 | 10.15 | 0.06 | 11.12 | | 0.067 | 5.98 | 1.033 | 0.86 |
| 6.3 | 0.05 | 9.15 | 0.05 | 10.17 | 0.06 | 11.13 | | 0.083 | 4.58 | 1.05 | 0.84 |
| 6.317 | 0.06 | 9.167 | 0.05 | 10.18 | 0.05 | 11.15 | | 0.1 | 3.26 | 1.067 | 0.83 |
| 6.333 | 0.05 | 9.183 | 0.05 | 10.2 | 0.05 | 11.17 | | 0.117 | 2.87 | 1.083 | 0.77 |
| 6.35 | 0.05 | 9.2 | 0.06 | 10.22 | 0.05 | 11.18 | | 0.133 | 1.13 | 1.1 | 0.7 |
| 6.367 | 0.05 | 9.217 | 0.05 | 10.23 | 0.05 | 11.2 | | 0.15 | 0.8 | 1.117 | 0.86 |
| 6.383 | 0.05 | 9.233 | 0.05 | 10.25 | 0.05 | 11.22 | | 0.167 | 0.98 | 1.133 | 0.84 |
| 6.4 | 0.06 | 9.25 | 0.05 | 10.27 | 0.06 | 11.23 | | 0.183 | 0.96 | 1.15 | 0.87 |
| 6.417 | 0.06 | 9.267 | 0.06 | 10.28 | 0.05 | 11.25 | | 0.2 | 1.09 | 1.167 | 1.13 |
| 6.433 | 0.06 | 9.283 | 0.05 | 10.3 | 0.05 | 11.27 | | 0.217 | 0.84 | 1.183 | 0.8 |
| 6.45 | 0.06 | 9.3 | 0.05 | 10.32 | 0.05 | 11.28 | | 0.233 | 0.8 | 1.2 | 0.74 |
| 6.467 | 0.06 | 9.317 | 0.05 | 10.33 | 0.06 | 11.3 | | 0.25 | 0.76 | 1.217 | 1.09 |
| 6.483 | 0.06 | 9.333 | 0.05 | 10.35 | 0.05 | 11.32 | | 0.267 | 0.91 | 1.233 | 0.68 |
| 6.5 | 0.06 | 9.35 | 0.06 | 10.37 | 0.05 | 11.33 | | 0.283 | 1.09 | 1.25 | 0.78 |

| Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) |
|----------|-----------|----------|-----------|----------|-----------|----------|-----------|----------|-----------|----------|-----------|
| 1.317 | 0.88 | 2.283 | 0.91 | 3.25 | 0.93 | 4.217 | 0.88 | 5.183 | 1.12 | 6.15 | 0.14 |
| 1.333 | 0.78 | 2.3 | 1.09 | 3.267 | 1.17 | 4.233 | 0.93 | 5.2 | 1.01 | 6.167 | 0.14 |
| 1.35 | 0.78 | 2.317 | 0.99 | 3.283 | 1.26 | 4.25 | 0.87 | 5.217 | 1.07 | 6.183 | 0.13 |
| 1.367 | 1.13 | 2.333 | 0.69 | 3.3 | 0.99 | 4.267 | 1.31 | 5.233 | 1.01 | 6.2 | 0.13 |
| 1.383 | 0.88 | 2.35 | 0.76 | 3.317 | 0.9 | 4.283 | 0.93 | 5.25 | 1.05 | 6.217 | 0.13 |
| 1.4 | 0.87 | 2.367 | 1.08 | 3.333 | 0.77 | 4.3 | 0.87 | 5.267 | 1.04 | 6.233 | 0.13 |
| 1.417 | 0.85 | 2.383 | 0.94 | 3.35 | 1.14 | 4.317 | 0.95 | 5.283 | 1.04 | 6.25 | 0.14 |
| 1.433 | 0.91 | 2.4 | 0.98 | 3.367 | 1.03 | 4.333 | 0.94 | 5.3 | 1.1 | 6.267 | 0.14 |
| 1.45 | 0.77 | 2.417 | 0.91 | 3.383 | 1.47 | 4.35 | 0.86 | 5.317 | 1 | 6.283 | 0.14 |
| 1.467 | 0.72 | 2.433 | 0.87 | 3.4 | 0.81 | 4.367 | 0.86 | 5.333 | 1.19 | 6.3 | 0.13 |
| 1.483 | 0.95 | 2.45 | 0.85 | 3.417 | 0.88 | 4.383 | 1.03 | 5.35 | 1.09 | 6.317 | 0.14 |
| 1.5 | 0.81 | 2.467 | 0.93 | 3.433 | 1.02 | 4.4 | 0.98 | 5.367 | 1.01 | 6.333 | 0.14 |
| 1.517 | 0.72 | 2.483 | 0.91 | 3.45 | 0.85 | 4.417 | 0.96 | 5.383 | 1.07 | 6.35 | 0.13 |
| 1.533 | 0.83 | 2.5 | 0.85 | 3.467 | 1.12 | 4.433 | 0.92 | 5.4 | 1.01 | 6.367 | 0.14 |
| 1.55 | 0.77 | 2.517 | 1.02 | 3.483 | 0.85 | 4.45 | 1.06 | 5.417 | 1.54 | 6.383 | 0.13 |
| 1.567 | 0.7 | 2.533 | 1.03 | 3.5 | 0.9 | 4.467 | 1.23 | 5.433 | 1.23 | 6.4 | 0.14 |
| 1.583 | 0.86 | 2.55 | 0.74 | 3.517 | 0.9 | 4.483 | 0.88 | 5.45 | 1.2 | 6.417 | 0.14 |
| 1.6 | 0.84 | 2.567 | 0.94 | 3.533 | 0.84 | 4.5 | 0.88 | 5.467 | 1 | 6.433 | 0.13 |
| 1.617 | 0.75 | 2.583 | 0.81 | 3.55 | 0.84 | 4.517 | 0.96 | 5.483 | 1.29 | 6.45 | 0.13 |
| 1.633 | 1.3 | 2.6 | 0.87 | 3.567 | 0.88 | 4.533 | 0.96 | 5.5 | 1.13 | 6.467 | 0.13 |
| 1.65 | 1.01 | 2.617 | 1.13 | 3.583 | 0.79 | 4.55 | 0.94 | 5.517 | 1.24 | 6.483 | 0.14 |
| 1.667 | 0.88 | 2.633 | 0.91 | 3.6 | 0.75 | 4.567 | 0.94 | 5.533 | 1.31 | 6.5 | 0.13 |
| 1.683 | 0.83 | 2.65 | 0.98 | 3.617 | 0.87 | 4.583 | 0.91 | 5.55 | 1.58 | 6.517 | 0.14 |
| 1.7 | 0.73 | 2.667 | 1.21 | 3.633 | 0.97 | 4.6 | 0.93 | 5.567 | 1.11 | 6.533 | 0.14 |
| 1.717 | 1.02 | 2.683 | 0.88 | 3.65 | 1.01 | 4.617 | 1.24 | 5.583 | 1.5 | 6.55 | 0.14 |
| 1.733 | 0.87 | 2.7 | 0.8 | 3.667 | 0.88 | 4.633 | 0.9 | 5.6 | 1.16 | 6.567 | 0.14 |
| 1.75 | 0.78 | 2.717 | 0.93 | 3.683 | 0.77 | 4.65 | 0.89 | 5.617 | 1.29 | 6.583 | 0.15 |
| 1.767 | 0.8 | 2.733 | 0.96 | 3.7 | 0.87 | 4.667 | 1.04 | 5.633 | 1.43 | 6.6 | 0.15 |
| 1.783 | 0.81 | 2.75 | 0.94 | 3.717 | 0.93 | 4.683 | 1.03 | 5.65 | 1.21 | 6.617 | 0.15 |
| 1.8 | 0.97 | 2.767 | 1.04 | 3.733 | 0.77 | 4.7 | 0.91 | 5.667 | 1.34 | 6.633 | 0.14 |
| 1.817 | 0.74 | 2.783 | 0.83 | 3.75 | 0.98 | 4.717 | 1.28 | 5.683 | 1.12 | 6.65 | 0.15 |
| 1.833 | 0.81 | 2.8 | 0.97 | 3.767 | 0.81 | 4.733 | 1.12 | 5.7 | 1.21 | 6.667 | 0.14 |
| 1.85 | 0.93 | 2.817 | 1.03 | 3.783 | 0.86 | 4.75 | 1.21 | 5.717 | 1.37 | 6.683 | 0.16 |
| 1.867 | 0.85 | 2.833 | 1.09 | 3.8 | 1.16 | 4.767 | 0.87 | 5.733 | 1.43 | 6.7 | 0.15 |
| 1.883 | 0.78 | 2.85 | 0.95 | 3.817 | 1.16 | 4.783 | 0.88 | 5.75 | 1.34 | 6.717 | 0.17 |
| 1.9 | 0.8 | 2.867 | 0.95 | 3.833 | 1.36 | 4.8 | 0.88 | 5.767 | 1.69 | 6.733 | 0.16 |
| 1.917 | 0.86 | 2.883 | 1.02 | 3.85 | 0.92 | 4.817 | 1.03 | 5.783 | 1.35 | 6.75 | 0.16 |
| 1.933 | 0.83 | 2.9 | 0.98 | 3.867 | 0.98 | 4.833 | 1.13 | 5.8 | 1.52 | 6.767 | 0.16 |
| 1.95 | 0.73 | 2.917 | 0.99 | 3.883 | 0.92 | 4.85 | 1.18 | 5.817 | 1.54 | 6.783 | 0.18 |
| 1.967 | 0.74 | 2.933 | 1 | 3.9 | 1.05 | 4.867 | 0.92 | 5.833 | 1.58 | 6.8 | 0.17 |
| 1.983 | 0.75 | 2.95 | 0.96 | 3.917 | 1.04 | 4.883 | 1.01 | 5.85 | 1.57 | 6.817 | 0.17 |
| 2 | 0.79 | 2.967 | 0.8 | 3.933 | 0.98 | 4.9 | 0.97 | 5.867 | 1.79 | 6.833 | 0.19 |
| 2.017 | 1.09 | 2.983 | 0.76 | 3.95 | 1.22 | 4.917 | 1.02 | 5.883 | 1.94 | 6.85 | 0.2 |
| 2.033 | 0.78 | 3 | 1.1 | 3.967 | 0.87 | 4.933 | 1 | 5.9 | 2.15 | 6.867 | 0.19 |
| 2.05 | 0.78 | 3.017 | 0.78 | 3.983 | 1.02 | 4.95 | 0.89 | 5.917 | 2.43 | 6.883 | 0.18 |
| 2.067 | 0.78 | 3.033 | 0.86 | 4 | 0.92 | 4.967 | 1.06 | 5.933 | 2.32 | 6.9 | 0.22 |
| 2.083 | 0.76 | 3.05 | 1.39 | 4.017 | 0.94 | 4.983 | 1.28 | 5.95 | 2.48 | 6.917 | 0.21 |
| 2.1 | 0.85 | 3.067 | 1.22 | 4.033 | 1.04 | 5 | 1.01 | 5.967 | 2.8 | 6.933 | 0.22 |
| 2.117 | 1.26 | 3.083 | 1.03 | 4.05 | 0.97 | 5.017 | 1 | 5.983 | 2.68 | 6.95 | 0.09 |
| 2.133 | 0.92 | 3.1 | 0.78 | 4.067 | 0.96 | 5.033 | 0.96 | 6 | 2.88 | 6.967 | 0.09 |
| 2.15 | 0.88 | 3.117 | 1.15 | 4.083 | 1.18 | 5.05 | 1.1 | 6.017 | 3.1 | 6.983 | 0.1 |
| 2.167 | 0.7 | 3.133 | 0.96 | 4.1 | 1.11 | 5.067 | 0.91 | 6.033 | 3.33 | 7 | 0.09 |
| 2.183 | 0.98 | 3.15 | 1.01 | 4.117 | 1.12 | 5.083 | 0.91 | 6.05 | 3.68 | 7.017 | 0.09 |
| 2.2 | 0.96 | 3.167 | 0.84 | 4.133 | 1.08 | 5.1 | 1.12 | 6.067 | 3.22 | 7.033 | 0.09 |
| 2.217 | 1.09 | 3.183 | 0.83 | 4.15 | 0.84 | 5.117 | 1.05 | 6.083 | 1.72 | 7.05 | 0.1 |
| 2.233 | 0.84 | 3.2 | 0.92 | 4.167 | 1.04 | 5.133 | 1.17 | 6.1 | 0.47 | 7.067 | 0.09 |

| Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) |
|----------|-----------|----------|-----------|----------|-----------|----------|-----------|----------|-----------|----------|-----------|
| 7.117 | 0.09 | 8.083 | 0.1 | 9.05 | 0.1 | 10.02 | 0.1 | 10.98 | | 11.95 | |
| 7.133 | 0.09 | 8.1 | 0.09 | 9.067 | 0.09 | 10.03 | 0.09 | 11 | | 11.97 | |
| 7.15 | 0.1 | 8.117 | 0.1 | 9.083 | 0.09 | 10.05 | 0.09 | 11.02 | | 11.98 | |
| 7.167 | 0.09 | 8.133 | 0.1 | 9.1 | 0.09 | 10.07 | 0.09 | 11.03 | | 12 | 8.17 |
| 7.183 | 0.09 | 8.15 | 0.08 | 9.117 | 0.1 | 10.08 | 0.1 | 11.05 | | 0 | 8.62 |
| 7.2 | 0.1 | 8.167 | 0.1 | 9.133 | 0.1 | 10.1 | 0.09 | 11.07 | | 0.017 | 8.38 |
| 7.217 | 0.1 | 8.183 | 0.09 | 9.15 | 0.1 | 10.12 | 0.1 | 11.08 | | 0.033 | 5.82 |
| 7.233 | 0.1 | 8.2 | 0.09 | 9.167 | 0.1 | 10.13 | 0.09 | 11.1 | | 0.05 | 3.63 |
| 7.25 | 0.1 | 8.217 | 0.09 | 9.183 | 0.1 | 10.15 | 0.09 | 11.12 | | 0.067 | 1.22 |
| 7.267 | 0.1 | 8.233 | 0.1 | 9.2 | 0.09 | 10.17 | 0.08 | 11.13 | | 0.083 | 1.01 |
| 7.283 | 0.1 | 8.25 | 0.09 | 9.217 | 0.1 | 10.18 | 0.08 | 11.15 | | 0.1 | 1.03 |
| 7.3 | 0.09 | 8.267 | 0.1 | 9.233 | 0.09 | 10.2 | 0.1 | 11.17 | | 0.117 | 0.96 |
| 7.317 | 0.09 | 8.283 | 0.09 | 9.25 | 0.09 | 10.22 | 0.09 | 11.18 | | 0.133 | 0.99 |
| 7.333 | 0.09 | 8.3 | 0.09 | 9.267 | 0.09 | 10.23 | 0.09 | 11.2 | | 0.15 | 1.07 |
| 7.35 | 0.1 | 8.317 | 0.08 | 9.283 | 0.1 | 10.25 | 0.08 | 11.22 | | 0.167 | 1.05 |
| 7.367 | 0.1 | 8.333 | 0.08 | 9.3 | 0.11 | 10.27 | 0.1 | 11.23 | | 0.183 | 1.08 |
| 7.383 | 0.1 | 8.35 | 0.1 | 9.317 | 0.1 | 10.28 | 0.1 | 11.25 | | 0.2 | 0.76 |
| 7.4 | 0.1 | 8.367 | 0.09 | 9.333 | 0.09 | 10.3 | 0.09 | 11.27 | | 0.217 | 0.79 |
| 7.417 | 0.1 | 8.383 | 0.09 | 9.35 | 0.1 | 10.32 | 0.09 | 11.28 | | 0.233 | 1.2 |
| 7.433 | 0.09 | 8.4 | 0.08 | 9.367 | 0.1 | 10.33 | 0.09 | 11.3 | | 0.25 | 0.87 |
| 7.45 | 0.1 | 8.417 | 0.1 | 9.383 | 0.08 | 10.35 | 0.1 | 11.32 | | 0.267 | 0.7 |
| 7.467 | 0.09 | 8.433 | 0.1 | 9.4 | 0.1 | 10.37 | 0.1 | 11.33 | | 0.283 | 0.94 |
| 7.483 | 0.09 | 8.45 | 0.09 | 9.417 | 0.09 | 10.38 | 0.1 | 11.35 | | 0.3 | 0.97 |
| 7.5 | 0.09 | 8.467 | 0.09 | 9.433 | 0.09 | 10.4 | 0.1 | 11.37 | | 0.317 | 0.93 |
| 7.517 | 0.1 | 8.483 | 0.09 | 9.45 | 0.09 | 10.42 | 0.1 | 11.38 | | 0.333 | 0.85 |
| 7.533 | 0.11 | 8.5 | 0.1 | 9.467 | 0.1 | 10.43 | 0.09 | 11.4 | | 0.35 | 0.72 |
| 7.55 | 0.1 | 8.517 | 0.1 | 9.483 | 0.09 | 10.45 | 0.1 | 11.42 | | 0.367 | 0.78 |
| 7.567 | 0.09 | 8.533 | 0.1 | 9.5 | 0.1 | 10.47 | 0.09 | 11.43 | | 0.383 | 0.8 |
| 7.583 | 0.1 | 8.55 | 0.1 | 9.517 | 0.09 | 10.48 | 0.09 | 11.45 | | 0.4 | 1.06 |
| 7.6 | 0.1 | 8.567 | 0.1 | 9.533 | 0.09 | 10.5 | 0.09 | 11.47 | | 0.417 | 0.88 |
| 7.617 | 0.08 | 8.583 | 0.09 | 9.55 | 0.08 | 10.52 | 0.1 | 11.48 | | 0.433 | 0.76 |
| 7.633 | 0.1 | 8.6 | 0.1 | 9.567 | 0.08 | 10.53 | 0.11 | 11.5 | | 0.45 | 1.09 |
| 7.65 | 0.09 | 8.617 | 0.09 | 9.583 | 0.1 | 10.55 | 0.1 | 11.52 | | 0.467 | 0.7 |
| 7.667 | 0.09 | 8.633 | 0.09 | 9.6 | 0.09 | 10.57 | 0.09 | 11.53 | | 0.483 | 0.71 |
| 7.683 | 0.09 | 8.65 | 0.09 | 9.617 | 0.09 | 10.58 | 0.1 | 11.55 | | 0.5 | 0.94 |
| 7.7 | 0.1 | 8.667 | 0.1 | 9.633 | 0.08 | 10.6 | 0.1 | 11.57 | | 0.517 | 0.73 |
| 7.717 | 0.09 | 8.683 | 0.11 | 9.65 | 0.1 | 10.62 | 0.08 | 11.58 | | 0.533 | 0.9 |
| 7.733 | 0.1 | 8.7 | 0.1 | 9.667 | 0.1 | 10.63 | 0.1 | 11.6 | | 0.55 | 0.74 |
| 7.75 | 0.09 | 8.717 | 0.09 | 9.683 | 0.09 | 10.65 | 0.09 | 11.62 | | 0.567 | 0.77 |
| 7.767 | 0.09 | 8.733 | 0.1 | 9.7 | 0.09 | 10.67 | 0.09 | 11.63 | | 0.583 | 0.77 |
| 7.783 | 0.08 | 8.75 | 0.1 | 9.717 | 0.09 | 10.68 | 0.09 | 11.65 | | 0.6 | 0.8 |
| 7.8 | 0.1 | 8.767 | 0.08 | 9.733 | 0.1 | 10.7 | 0.1 | 11.67 | | 0.617 | 0.68 |
| 7.817 | 0.1 | 8.783 | 0.1 | 9.75 | 0.1 | 10.72 | 0.09 | 11.68 | | 0.633 | 0.86 |
| 7.833 | 0.09 | 8.8 | 0.09 | 9.767 | 0.1 | 10.73 | 0.1 | 11.7 | | 0.65 | 1.73 |
| 7.85 | 0.09 | 8.817 | 0.09 | 9.783 | 0.1 | 10.75 | 0.09 | 11.72 | | 0.667 | 0.79 |
| 7.867 | 0.09 | 8.833 | 0.09 | 9.8 | 0.1 | 10.77 | 0.09 | 11.73 | | 0.683 | 1.66 |
| 7.883 | 0.1 | 8.85 | 0.1 | 9.817 | 0.09 | 10.78 | 0.08 | 11.75 | | 0.7 | 0.85 |
| 7.9 | 0.1 | 8.867 | 0.09 | 9.833 | 0.1 | 10.8 | 0.08 | 11.77 | | 0.717 | 0.92 |
| 7.917 | 0.1 | 8.883 | 0.1 | 9.85 | 0.09 | 10.82 | 0.08 | 11.78 | | 0.733 | 0.69 |
| 7.933 | 0.1 | 8.9 | 0.09 | 9.867 | 0.09 | 10.83 | 0.08 | 11.8 | | 0.75 | 0.93 |
| 7.95 | 0.1 | 8.917 | 0.09 | 9.883 | 0.09 | 10.85 | | 11.82 | | 0.767 | 0.91 |
| 7.967 | 0.09 | 8.933 | 0.08 | 9.9 | 0.1 | 10.87 | | 11.83 | | 0.783 | 0.83 |
| 7.983 | 0.1 | 8.95 | 0.08 | 9.917 | 0.11 | 10.88 | | 11.85 | | 0.8 | 1.05 |
| 8 | 0.09 | 8.967 | 0.1 | 9.933 | 0.1 | 10.9 | | 11.87 | | 0.817 | 0.97 |
| 8.017 | 0.09 | 8.983 | 0.09 | 9.95 | 0.09 | 10.92 | | 11.88 | | 0.833 | 1.03 |
| 8.033 | 0.09 | 9 | 0.09 | 9.967 | 0.1 | 10.93 | | 11.9 | | 0.85 | 0.87 |

| Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) |
|----------|-----------|----------|-----------|----------|-----------|----------|-----------|----------|-----------|----------|-----------|
| 0.9 | 0.8 | 1.858 | 0.96 | 2.817 | 0.94 | 3.767 | 0.67 | 4.725 | 0.69 | 5.683 | 2.74 |
| 0.917 | 1.02 | 1.875 | 0.89 | 2.833 | 1.04 | 3.783 | 0.75 | 4.742 | 0.76 | 5.7 | 2.9 |
| 0.933 | 0.72 | 1.892 | 1.02 | 2.85 | 1.26 | 3.8 | 0.74 | 4.758 | 0.76 | 5.717 | 3.17 |
| 0.95 | 0.77 | 1.908 | 0.95 | 2.867 | 1.1 | 3.817 | 0.68 | 4.775 | 0.76 | 5.733 | 3.36 |
| 0.967 | 0.77 | 1.925 | 1.31 | 2.875 | 0.81 | 3.833 | 0.78 | 4.792 | 0.75 | 5.75 | 3.66 |
| 0.983 | 0.78 | 1.942 | 0.94 | 2.892 | 0.91 | 3.85 | 1.03 | 4.808 | 0.74 | 5.767 | 3.9 |
| 1 | 1.09 | 1.958 | 0.84 | 2.908 | 0.73 | 3.867 | 0.74 | 4.825 | 0.74 | 5.783 | 4.13 |
| 1.017 | 0.92 | 1.975 | 0.84 | 2.925 | 0.78 | 3.883 | 0.69 | 4.842 | 0.94 | 5.8 | 4.39 |
| 1.033 | 0.83 | 1.992 | 1.21 | 2.942 | 0.82 | 3.9 | 0.84 | 4.858 | 0.74 | 5.817 | 4.58 |
| 1.05 | 1.23 | 2.008 | 0.98 | 2.958 | 0.72 | 3.917 | 0.93 | 4.875 | 0.74 | 5.833 | 4.86 |
| 1.067 | 1.18 | 2.025 | 1.07 | 2.975 | 0.71 | 3.933 | 0.63 | 4.892 | 0.75 | 5.85 | 5.08 |
| 1.083 | 0.95 | 2.042 | 0.9 | 2.992 | 1.05 | 3.95 | 0.71 | 4.908 | 0.74 | 5.867 | 5.38 |
| 1.1 | 0.77 | 2.058 | 0.88 | 3.008 | 0.87 | 3.967 | 0.73 | 4.925 | 0.86 | 5.883 | 5.63 |
| 1.117 | 1.31 | 2.075 | 0.89 | 3.025 | 0.7 | 3.983 | 0.65 | 4.942 | 0.77 | 5.9 | 5.99 |
| 1 | 1 | 2.092 | 1.28 | 3.042 | 0.79 | 4 | 0.67 | 4.958 | 1 | 5.908 | 6.05 |
| 1.15 | 1.01 | 2.108 | 1.17 | 3.058 | 0.71 | 4.017 | 0.7 | 4.975 | 0.88 | 5.925 | 6.13 |
| 1.167 | 0.91 | 2.117 | 1.12 | 3.075 | 0.52 | 4.033 | 0.8 | 4.992 | 0.74 | 5.942 | 6.32 |
| 1.183 | 1.03 | 2.133 | 0.95 | 3.092 | 0.4 | 4.05 | 0.68 | 5.008 | 0.83 | 5.958 | 6.51 |
| 1.2 | 0.89 | 2.15 | 1.25 | 3.108 | 0.39 | 4.067 | 0.68 | 5.025 | 0.77 | 5.975 | 6.66 |
| 1.217 | 1.16 | 2.167 | 0.9 | 3.125 | 0.47 | 4.083 | 0.67 | 5.042 | 0.81 | 5.992 | 6.92 |
| 1.233 | 0.91 | 2.183 | 0.88 | 3.142 | 0.46 | 4.1 | 0.66 | 5.058 | 0.75 | 6.008 | 6.59 |
| 1.25 | 0.9 | 2.2 | 1.08 | 3.158 | 3 | 4.117 | 0.84 | 5.075 | 0.89 | 6.025 | 5.68 |
| 1.267 | 1.05 | 2.217 | 0.92 | 3.175 | 0.67 | 4.133 | 0.75 | 5.092 | 1 | 6.042 | 4.95 |
| 1.283 | 0.83 | 2.233 | 0.89 | 3.192 | 0.9 | 4.15 | 0.64 | 5.108 | 1.24 | 6.058 | 4.29 |
| 1.3 | 0.82 | 2.25 | 0.93 | 3.208 | 0.61 | 4.167 | 0.65 | 5.125 | 0.82 | 6.075 | 3.69 |
| 1.317 | 0.95 | 2.267 | 0.88 | 3.225 | 1 | 4.183 | 0.75 | 5.142 | 0.88 | 6.092 | 3.09 |
| 1.333 | 0.8 | 2.283 | 1.17 | 3.242 | 0.64 | 4.2 | 0.72 | 5.15 | 0.87 | 6.108 | 2.57 |
| 1.35 | 1 | 2.3 | 1.02 | 3.258 | 0.85 | 4.217 | 0.87 | 5.167 | 0.9 | 6.125 | 2.08 |
| 1.358 | 1.24 | 2.317 | 1.02 | 3.275 | 0.76 | 4.233 | 0.65 | 5.183 | 0.87 | 6.142 | 1.63 |
| 1.375 | 0.92 | 2.333 | 0.87 | 3.292 | 0.63 | 4.25 | 0.68 | 5.2 | 0.82 | 6.158 | 1.22 |
| 1.392 | 0.93 | 2.35 | 0.87 | 3.308 | 0.72 | 4.267 | 0.68 | 5.217 | 0.85 | 6.175 | 0.84 |
| 1.408 | 0.81 | 2.367 | 0.8 | 3.325 | 1.03 | 4.283 | 0.71 | 5.233 | 0.84 | 6.192 | 0.52 |
| 1.425 | 1.01 | 2.383 | 0.89 | 3.342 | 0.65 | 4.3 | 0.81 | 5.25 | 0.81 | 6.208 | 0.26 |
| 1.442 | 0.78 | 2.4 | 0.94 | 3.358 | 0.66 | 4.317 | 0.7 | 5.267 | 0.85 | 6.225 | 0.2 |
| 1.458 | 0.8 | 2.417 | 0.83 | 3.375 | 0.63 | 4.333 | 0.74 | 5.283 | 0.85 | 6.242 | 0.19 |
| 1.475 | 0.9 | 2.433 | 1.32 | 3.392 | 0.69 | 4.35 | 0.73 | 5.3 | 0.85 | 6.258 | 0.17 |
| 1.492 | 0.86 | 2.45 | 0.96 | 3.408 | 0.66 | 4.367 | 0.73 | 5.317 | 0.88 | 6.275 | 0.17 |
| 1.508 | 0.88 | 2.467 | 0.96 | 3.425 | 0.69 | 4.383 | 0.67 | 5.333 | 0.91 | 6.292 | 0.18 |
| 1.525 | 1.02 | 2.483 | 0.95 | 3.442 | 0.69 | 4.392 | 0.74 | 5.35 | 0.92 | 6.308 | 0.18 |
| 1.542 | 0.86 | 2.5 | 1.1 | 3.458 | 0.68 | 4.408 | 0.76 | 5.367 | 0.99 | 6.325 | 0.17 |
| 1.558 | 0.99 | 2.517 | 0.8 | 3.475 | 0.87 | 4.425 | 0.71 | 5.383 | 0.96 | 6.342 | 0.17 |
| 1.575 | 1 | 2.533 | 1.17 | 3.492 | 0.76 | 4.442 | 0.79 | 5.4 | 1.03 | 6.358 | 0.17 |
| 1.592 | 0.77 | 2.55 | 0.91 | 3.508 | 0.72 | 4.458 | 0.81 | 5.417 | 0.96 | 6.375 | 0.17 |
| 1.608 | 0.88 | 2.567 | 0.83 | 3.525 | 0.76 | 4.475 | 0.68 | 5.433 | 0.93 | 6.392 | 0.17 |
| 1.625 | 1.21 | 2.583 | 0.97 | 3.542 | 0.73 | 4.492 | 0.69 | 5.45 | 1.15 | 6.408 | 0.16 |
| 1.642 | 1.23 | 2.6 | 0.93 | 3.558 | 0.66 | 4.508 | 0.8 | 5.467 | 1.02 | 6.425 | 0.17 |
| 1.658 | 1.02 | 2.617 | 1.07 | 3.575 | 0.72 | 4.525 | 0.72 | 5.483 | 1.1 | 6.442 | 0.17 |
| 1.675 | 0.81 | 2.633 | 1.37 | 3.592 | 0.84 | 4.542 | 0.72 | 5.5 | 1.13 | 6.458 | 0.17 |
| 1.692 | 0.92 | 2.65 | 0.72 | 3.608 | 0.65 | 4.558 | 0.68 | 5.517 | 1.14 | 6.475 | 0.16 |
| 1.708 | 0.91 | 2.667 | 0.96 | 3.625 | 0.67 | 4.575 | 1.12 | 5.533 | 1.28 | 6.492 | 0.16 |
| 1.725 | 1.03 | 2.683 | 0.9 | 3.633 | 0.73 | 4.592 | 0.69 | 5.55 | 1.29 | 6.508 | 0.16 |
| 1.742 | 0.89 | 2.7 | 0.81 | 3.65 | 0.68 | 4.608 | 0.86 | 5.567 | 1.39 | 6.525 | 0.16 |
| 1.758 | 0.81 | 2.717 | 0.7 | 3.667 | 0.64 | 4.625 | 0.66 | 5.583 | 1.55 | 6.542 | 0.16 |
| 1.775 | 0.77 | 2.733 | 0.74 | 3.683 | 0.76 | 4.642 | 0.75 | 5.6 | 1.64 | 6.558 | 0.16 |
| 1.792 | 1.25 | 2.75 | 0.94 | 3.7 | 0.99 | 4.658 | 0.72 | 5.617 | 1.76 | 6.575 | 0.16 |
| 1.808 | 1 | 2.767 | 0.85 | 3.717 | 0.68 | 4.675 | 0.72 | 5.633 | 2.12 | 6.592 | 0.16 |

| Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) |
|----------|-----------|----------|-----------|----------|-----------|----------|-----------|----------|-----------|----------|-----------|
| 6.642 | 0.16 | 7.592 | 0.17 | 8.55 | 0.18 | 9.508 | 0.16 | 10.46 | 0.17 | 11.42 | |
| 6.658 | 0.17 | 7.608 | 0.16 | 8.567 | 0.16 | 9.525 | 0.17 | 10.48 | 0.16 | 11.43 | |
| 6.667 | 0.18 | 7.625 | 0.16 | 8.583 | 0.16 | 9.542 | 0.17 | 10.49 | 0.16 | 11.45 | |
| 6.683 | 0.17 | 7.642 | 0.16 | 8.6 | 0.16 | 9.558 | 0.18 | 10.51 | 0.16 | 11.47 | |
| 6.7 | 0.17 | 7.658 | 0.16 | 8.617 | 0.16 | 9.575 | 0.16 | 10.53 | 0.16 | 11.48 | |
| 6.717 | 0.17 | 7.675 | 0.15 | 8.633 | 0.16 | 9.592 | 0.18 | 10.54 | 0.15 | 11.5 | |
| 6.733 | 0.17 | 7.692 | 0.16 | 8.65 | 0.15 | 9.608 | 0.18 | 10.56 | 0.16 | 11.52 | |
| 6.75 | 0.17 | 7.708 | 0.15 | 8.667 | 0.17 | 9.625 | 0.18 | 10.58 | 0.15 | 11.53 | |
| 6.767 | 0.16 | 7.725 | 0.16 | 8.683 | 0.16 | 9.642 | 0.16 | 10.59 | 0.16 | 11.55 | |
| 6.783 | 0.17 | 7.742 | 0.18 | 8.7 | 0.16 | 9.658 | 0.16 | 10.61 | 0.18 | 11.57 | |
| 6.8 | 0.17 | 7.758 | 0.17 | 8.717 | 0.16 | 9.675 | 0.16 | 10.63 | 0.17 | 11.58 | |
| 6.817 | 0.17 | 7.775 | 0.17 | 8.733 | 0.16 | 9.692 | 0.16 | 10.64 | 0.17 | 11.6 | |
| 6.833 | 0.16 | 7.792 | 0.17 | 8.75 | 0.15 | 9.7 | 0.16 | 10.66 | 0.17 | 11.62 | |
| 6.85 | 0.16 | 7.808 | 0.17 | 8.767 | 0.16 | 9.717 | 0.16 | 10.68 | 0.17 | 11.63 | |
| 6.867 | 0.16 | 7.825 | 0.17 | 8.783 | 0.15 | 9.733 | 0.16 | 10.69 | 0.17 | 11.65 | |
| 6.883 | 0.16 | 7.842 | 0.16 | 8.8 | 0.16 | 9.75 | 0.16 | 10.71 | 0.16 | 11.67 | |
| 6.9 | 0.16 | 7.858 | 0.17 | 8.817 | 0.18 | 9.767 | 0.16 | 10.73 | 0.17 | 11.68 | |
| 6.917 | 0.16 | 7.875 | 0.17 | 8.833 | 0.17 | 9.783 | 0.16 | 10.74 | 0.17 | 11.7 | |
| 6.933 | 0.16 | 7.892 | 0.17 | 8.85 | 0.17 | 9.8 | 0.16 | 10.76 | 0.17 | 11.72 | |
| 6.95 | 0.16 | 7.908 | 0.16 | 8.867 | 0.17 | 9.817 | 0.16 | 10.78 | 0.16 | 11.73 | |
| 6.967 | 0.15 | 7.925 | 0.16 | 8.883 | 0.17 | 9.833 | 0.15 | 10.79 | 0.16 | 11.75 | |
| 6.983 | 0.16 | 7.942 | 0.16 | 8.9 | 0.17 | 9.85 | 0.16 | 10.81 | 0.16 | 11.77 | |
| 7 | 0.16 | 7.958 | 0.16 | 8.917 | 0.16 | 9.867 | 0.16 | 10.83 | 0.16 | 11.78 | |
| 7.017 | 0.17 | 7.975 | 0.16 | 8.933 | 0.17 | 9.883 | 0.17 | 10.84 | | 11.8 | |
| 7.033 | 0.17 | 7.992 | 0.16 | 8.942 | 0.16 | 9.9 | 0.17 | 10.86 | | 11.82 | |
| 7.05 | 0.18 | 8.008 | 0.16 | 8.958 | 0.16 | 9.917 | 0.18 | 10.88 | | 11.83 | |
| 7.067 | 0.16 | 8.025 | 0.16 | 8.975 | 0.16 | 9.933 | 0.16 | 10.89 | | 11.85 | |
| 7.083 | 0.18 | 8.042 | 0.15 | 8.992 | 0.16 | 9.95 | 0.18 | 10.91 | | 11.87 | |
| 7.1 | 0.18 | 8.058 | 0.16 | 9.008 | 0.15 | 9.967 | 0.18 | 10.93 | | 11.88 | |
| 7.117 | 0.18 | 8.075 | 0.16 | 9.025 | 0.17 | 9.983 | 0.18 | 10.94 | | 11.9 | |
| 7.133 | 0.16 | 8.092 | 0.17 | 9.042 | 0.16 | 10 | 0.16 | 10.96 | | 11.92 | |
| 7.15 | 0.16 | 8.108 | 0.17 | 9.058 | 0.16 | 10.02 | 0.16 | 10.98 | | 11.93 | |
| 7.167 | 0.16 | 8.125 | 0.18 | 9.075 | 0.16 | 10.03 | 0.16 | 10.99 | | 11.95 | |
| 7.183 | 0.16 | 8.142 | 0.16 | 9.092 | 0.16 | 10.05 | 0.16 | 11.01 | | 11.97 | |
| 7.2 | 0.16 | 8.158 | 0.18 | 9.108 | 0.15 | 10.07 | 0.16 | 11.03 | | 11.98 | |
| 7.217 | 0.15 | 8.175 | 0.18 | 9.125 | 0.16 | 10.08 | 0.15 | 11.04 | | 11.99 | |
| 7.233 | 0.17 | 8.183 | 0.17 | 9.142 | 0.15 | 10.1 | 0.17 | 11.06 | | 12 | |
| 7.25 | 0.16 | 8.2 | 0.16 | 9.158 | 0.16 | 10.12 | 0.16 | 11.08 | | 0.133 | 1.61 |
| 7.267 | 0.16 | 8.217 | 0.17 | 9.175 | 0.18 | 10.13 | 0.16 | 11.09 | | 0.15 | 1.61 |
| 7.283 | 0.16 | 8.233 | 0.17 | 9.192 | 0.17 | 10.15 | 0.16 | 11.11 | | 0.167 | 1.22 |
| 7.3 | 0.16 | 8.25 | 0.17 | 9.208 | 0.17 | 10.17 | 0.16 | 11.13 | | 0.183 | 1.58 |
| 7.317 | 0.15 | 8.267 | 0.16 | 9.225 | 0.17 | 10.18 | 0.15 | 11.14 | | 0.2 | 1.76 |
| 7.333 | 0.16 | 8.283 | 0.16 | 9.242 | 0.17 | 10.2 | 0.16 | 11.16 | | 0.217 | 0.71 |
| 7.35 | 0.15 | 8.3 | 0.16 | 9.258 | 0.17 | 10.22 | 0.15 | 11.18 | | 0.233 | 0.6 |
| 7.367 | 0.16 | 8.317 | 0.16 | 9.275 | 0.16 | 10.23 | 0.16 | 11.19 | | 0.25 | 0.62 |
| 7.383 | 0.18 | 8.333 | 0.16 | 9.292 | 0.17 | 10.25 | 0.18 | 11.21 | | 0.267 | 0.6 |
| 7.4 | 0.17 | 8.35 | 0.16 | 9.308 | 0.17 | 10.27 | 0.17 | 11.22 | | 0.283 | 0.8 |
| 7.417 | 0.17 | 8.367 | 0.16 | 9.325 | 0.17 | 10.28 | 0.17 | 11.23 | | 0.3 | 0.65 |
| 7.425 | 0.16 | 8.383 | 0.16 | 9.342 | 0.16 | 10.3 | 0.17 | 11.25 | | 0.317 | 0.57 |
| 7.442 | 0.18 | 8.4 | 0.15 | 9.358 | 0.16 | 10.32 | 0.17 | 11.27 | | 0.333 | 0.98 |
| 7.458 | 0.18 | 8.417 | 0.16 | 9.375 | 0.16 | 10.33 | 0.17 | 11.28 | | 0.35 | 0.86 |
| 7.475 | 0.18 | 8.433 | 0.16 | 9.392 | 0.16 | 10.35 | 0.16 | 11.3 | | 0.367 | 0.57 |
| 7.492 | 0.16 | 8.45 | 0.17 | 9.408 | 0.16 | 10.37 | 0.17 | 11.32 | | 0.383 | 0.74 |
| 7.508 | 0.16 | 8.467 | 0.17 | 9.425 | 0.16 | 10.38 | 0.17 | 11.33 | | 0.4 | 0.6 |
| 7.525 | 0.16 | 8.483 | 0.18 | 9.442 | 0.16 | 10.4 | 0.17 | 11.35 | | 0.417 | 0.67 |
| 7.542 | 0.16 | 8.5 | 0.16 | 9.458 | 0.16 | 10.42 | 0.16 | 11.37 | | 0.433 | 0.63 |

| Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) |
|----------|-----------|----------|-----------|----------|-----------|----------|-----------|----------|-----------|----------|-----------|
| 0.483 | 0.62 | 1.45 | 0.57 | 2.417 | 0.62 | 3.383 | 0.57 | 4.35 | 0.62 | 5.317 | 7.29 |
| 0.5 | 0.6 | 1.467 | 0.74 | 2.433 | 0.59 | 3.4 | 0.51 | 4.367 | 0.58 | 5.333 | 7.27 |
| 0.517 | 0.67 | 1.483 | 0.6 | 2.45 | 0.58 | 3.417 | 0.57 | 4.383 | 0.65 | 5.35 | 7.29 |
| 0.533 | 0.59 | 1.5 | 0.67 | 2.467 | 0.6 | 3.433 | 0.6 | 4.4 | 0.66 | 5.367 | 7.29 |
| 0.55 | 0.7 | 1.517 | 0.62 | 2.483 | 0.59 | 3.45 | 0.6 | 4.417 | 0.68 | 5.383 | 7.3 |
| 0.567 | 0.6 | 1.533 | 0.8 | 2.5 | 0.56 | 3.467 | 0.71 | 4.433 | 0.59 | 5.4 | 7.31 |
| 0.583 | 0.7 | 1.55 | 0.65 | 2.517 | 0.55 | 3.483 | 0.55 | 4.45 | 0.65 | 5.417 | 7.33 |
| 0.6 | 0.65 | 1.567 | 0.57 | 2.533 | 0.71 | 3.5 | 0.62 | 4.467 | 0.67 | 5.433 | 7.31 |
| 0.617 | 0.72 | 1.583 | 0.98 | 2.55 | 0.61 | 3.517 | 0.6 | 4.483 | 0.75 | 5.45 | 7.33 |
| 0.633 | 1.08 | 1.6 | 0.86 | 2.567 | 0.64 | 3.533 | 0.52 | 4.5 | 0.68 | 5.467 | 7.33 |
| 0.65 | 0.55 | 1.617 | 0.57 | 2.583 | 0.56 | 3.55 | 0.62 | 4.517 | 0.74 | 5.483 | 7.3 |
| 0.667 | 0.72 | 1.633 | 0.74 | 2.6 | 0.55 | 3.567 | 0.59 | 4.533 | 0.81 | 5.5 | 7.3 |
| 0.683 | 0.63 | 1.65 | 0.6 | 2.617 | 0.66 | 3.583 | 0.63 | 4.55 | 1 | 5.517 | 7.28 |
| 0.7 | 0.57 | 1.667 | 0.67 | 2.633 | 0.61 | 3.6 | 0.53 | 4.567 | 1.13 | 5.533 | 7.31 |
| 0.717 | 0.57 | 1.683 | 0.63 | 2.65 | 0.61 | 3.617 | 0.56 | 4.583 | 1.67 | 5.55 | 7.31 |
| 0.733 | 0.56 | 1.7 | 0.61 | 2.667 | 0.55 | 3.633 | 0.53 | 4.6 | 1.84 | 5.567 | 7.31 |
| 0.75 | 0.81 | 1.717 | 0.73 | 2.683 | 0.6 | 3.65 | 0.49 | 4.617 | 2.25 | 5.583 | 7.33 |
| 0.767 | 0.57 | 1.733 | 0.62 | 2.7 | 0.54 | 3.667 | 0.54 | 4.633 | 2.6 | 5.6 | 7.37 |
| 0.783 | 0.74 | 1.75 | 0.6 | 2.717 | 0.59 | 3.683 | 0.59 | 4.65 | 3.04 | 5.617 | 7.35 |
| 0.8 | 0.75 | 1.767 | 0.67 | 2.733 | 0.54 | 3.7 | 0.57 | 4.667 | 3.49 | 5.633 | 7.34 |
| 0.817 | 0.79 | 1.783 | 0.59 | 2.75 | 0.51 | 3.717 | 0.58 | 4.683 | 3.89 | 5.65 | 7.3 |
| 0.833 | 0.73 | 1.8 | 0.7 | 2.767 | 0.58 | 3.733 | 0.73 | 4.7 | 4.26 | 5.667 | 7.31 |
| 0.85 | 0.79 | 1.817 | 0.6 | 2.783 | 0.56 | 3.75 | 0.54 | 4.717 | 4.6 | 5.683 | 7.29 |
| 0.867 | 0.71 | 1.833 | 0.7 | 2.8 | 0.59 | 3.767 | 0.63 | 4.733 | 4.92 | 5.7 | 7.3 |
| 0.883 | 0.6 | 1.85 | 0.65 | 2.817 | 0.55 | 3.783 | 0.61 | 4.75 | 5.19 | 5.717 | 7.34 |
| 0.9 | 0.62 | 1.867 | 0.72 | 2.833 | 0.54 | 3.8 | 0.58 | 4.767 | 5.53 | 5.733 | 7.32 |
| 0.917 | 0.6 | 1.883 | 1.08 | 2.85 | 0.54 | 3.817 | 0.53 | 4.783 | 5.77 | 5.75 | 7.33 |
| 0.933 | 0.8 | 1.9 | 0.55 | 2.867 | 0.58 | 3.833 | 0.64 | 4.8 | 6.02 | 5.767 | 7.32 |
| 0.95 | 0.65 | 1.917 | 0.72 | 2.883 | 0.76 | 3.85 | 0.54 | 4.817 | 6.22 | 5.783 | 7.34 |
| 0.967 | 0.57 | 1.933 | 0.63 | 2.9 | 0.66 | 3.867 | 0.61 | 4.833 | 6.41 | 5.8 | 7.34 |
| 0.983 | 0.98 | 1.95 | 0.57 | 2.917 | 0.53 | 3.883 | 0.62 | 4.85 | 6.56 | 5.817 | 7.35 |
| 1 | 0.86 | 1.967 | 0.57 | 2.933 | 0.55 | 3.9 | 0.57 | 4.867 | 6.71 | 5.833 | 7.34 |
| 1.017 | 0.57 | 1.983 | 0.56 | 2.95 | 0.61 | 3.917 | 0.57 | 4.883 | 6.72 | 5.85 | 7.33 |
| 1.033 | 0.74 | 2 | 0.81 | 2.967 | 0.56 | 3.933 | 0.51 | 4.9 | 6.88 | 5.867 | 7.35 |
| 1.05 | 0.6 | 2.017 | 0.57 | 2.983 | 0.54 | 3.95 | 0.97 | 4.917 | 7.02 | 5.883 | 7.35 |
| 1.067 | 0.67 | 2.033 | 0.74 | 3 | 0.63 | 3.967 | 0.59 | 4.933 | 7.09 | 5.9 | 7.34 |
| 1.083 | 0.71 | 2.05 | 0.75 | 3.017 | 0.72 | 3.983 | 0.61 | 4.95 | 7.16 | 5.917 | 7.33 |
| 1.1 | 0.6 | 2.067 | 0.79 | 3.033 | 0.59 | 4 | 0.6 | 4.967 | 7.18 | 5.933 | 7.35 |
| 1 | 0.62 | 2.083 | 0.73 | 3.05 | 0.51 | 4.017 | 0.58 | 4.983 | 7.23 | 5.95 | 7.31 |
| 1.133 | 0.6 | 2.1 | 0.79 | 3.067 | 0.79 | 4.033 | 0.55 | 5 | 7.23 | 5.967 | 7.34 |
| 1.15 | 0.8 | 2.117 | 1.13 | 3.083 | 0.6 | 4.05 | 0.55 | 5.017 | 7.34 | 5.983 | 7.11 |
| 1.167 | 0.65 | 2.133 | 0.67 | 3.1 | 0.58 | 4.067 | 0.64 | 5.033 | 7.3 | 6 | 6.63 |
| 1.183 | 0.57 | 2.15 | 0.74 | 3.117 | 0.51 | 4.083 | 0.5 | 5.05 | 7.37 | 6.017 | 6.23 |
| 1.2 | 0.98 | 2.167 | 0.76 | 3.133 | 0.53 | 4.1 | 0.58 | 5.067 | 7.36 | 6.033 | 5.83 |
| 1.217 | 0.86 | 2.183 | 0.77 | 3.15 | 0.53 | 4.117 | 0.65 | 5.083 | 7.33 | 6.05 | 5.74 |
| 1.233 | 0.57 | 2.2 | 0.8 | 3.167 | 0.55 | 4.133 | 0.53 | 5.1 | 7.42 | 6.067 | 5.31 |
| 1.25 | 0.74 | 2.217 | 0.8 | 3.183 | 0.71 | 4.15 | 0.57 | 5.117 | 7.42 | 6.083 | 4.91 |
| 1.267 | 0.6 | 2.233 | 0.68 | 3.2 | 0.5 | 4.167 | 0.54 | 5.133 | 7.45 | 6.1 | 4.47 |
| 1.283 | 0.67 | 2.25 | 0.64 | 3.217 | 0.55 | 4.183 | 0.56 | 5.15 | 7.45 | 6.117 | 4.09 |
| 1.3 | 0.71 | 2.267 | 0.66 | 3.233 | 0.51 | 4.2 | 0.53 | 5.167 | 7.44 | 6.133 | 3.79 |
| 1.317 | 0.6 | 2.283 | 0.62 | 3.25 | 0.55 | 4.217 | 0.58 | 5.183 | 7.44 | 6.15 | 3.39 |
| 1.333 | 0.62 | 2.3 | 0.61 | 3.267 | 0.55 | 4.233 | 0.57 | 5.2 | 7.47 | 6.167 | 3.07 |
| 1.35 | 0.6 | 2.317 | 0.59 | 3.283 | 0.53 | 4.25 | 0.55 | 5.217 | 7.28 | 6.183 | 2.76 |
| 1.367 | 0.8 | 2.333 | 0.63 | 3.3 | 0.59 | 4.267 | 0.55 | 5.233 | 7.31 | 6.2 | 2.48 |
| 1.383 | 0.65 | 2.35 | 0.58 | 3.317 | 0.67 | 4.283 | 0.54 | 5.25 | 7.29 | 6.217 | 2.18 |
| 1.4 | 0.57 | 2.367 | 0.7 | 3.333 | 0.54 | 4.3 | 0.56 | 5.267 | 7.27 | 6.233 | 1.92 |
| 1.417 | 0.98 | 2.383 | 0.58 | 3.35 | 0.53 | 4.317 | 0.56 | 5.283 | 7.31 | 6.25 | 1.66 |

| Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) |
|----------|-----------|----------|-----------|----------|-----------|----------|-----------|----------|-----------|----------|-----------|
| 6.283 | 1.12 | 7.25 | 0.07 | 8.217 | 0.08 | 9.183 | 0.07 | 10.15 | 0.05 | 11.12 | |
| 6.3 | 0.87 | 7.267 | 0.07 | 8.233 | 0.08 | 9.2 | 0.07 | 10.17 | 0.07 | 11.13 | |
| 6.317 | 0.65 | 7.283 | 0.06 | 8.25 | 0.07 | 9.217 | 0.07 | 10.18 | 0.07 | 11.15 | |
| 6.333 | 0.47 | 7.3 | 0.06 | 8.267 | 0.07 | 9.233 | 0.07 | 10.2 | 0.06 | 11.17 | |
| 6.35 | 0.31 | 7.317 | 0.07 | 8.283 | 0.07 | 9.25 | 0.06 | 10.22 | 0.06 | 11.18 | |
| 6.367 | 0.18 | 7.333 | 0.06 | 8.3 | 0.08 | 9.267 | 0.06 | 10.23 | 0.06 | 11.2 | |
| 6.383 | 0.12 | 7.35 | 0.05 | 8.317 | 0.07 | 9.283 | 0.07 | 10.25 | 0.07 | 11.22 | |
| 6.4 | 0.11 | 7.367 | 0.05 | 8.333 | 0.06 | 9.3 | 0.06 | 10.27 | 0.09 | 11.23 | |
| 6.417 | 0.08 | 7.383 | 0.08 | 8.35 | 0.07 | 9.317 | 0.05 | 10.28 | 0.08 | 11.25 | |
| 6.433 | 0.08 | 7.4 | 0.08 | 8.367 | 0.07 | 9.333 | 0.05 | 10.3 | 0.07 | 11.27 | |
| 6.45 | 0.08 | 7.417 | 0.08 | 8.383 | 0.06 | 9.35 | 0.08 | 10.32 | 0.08 | 11.28 | |
| 6.467 | 0.07 | 7.433 | 0.07 | 8.4 | 0.06 | 9.367 | 0.08 | 10.33 | 0.07 | 11.3 | |
| 6.483 | 0.07 | 7.45 | 0.07 | 8.417 | 0.06 | 9.383 | 0.08 | 10.35 | 0.07 | 11.32 | |
| 6.5 | 0.07 | 7.467 | 0.07 | 8.433 | 0.07 | 9.4 | 0.07 | 10.37 | 0.07 | 11.33 | |
| 6.517 | 0.08 | 7.483 | 0.08 | 8.45 | 0.06 | 9.417 | 0.07 | 10.38 | 0.07 | 11.35 | |
| 6.533 | 0.07 | 7.5 | 0.07 | 8.467 | 0.07 | 9.433 | 0.07 | 10.4 | 0.06 | 11.37 | |
| 6.55 | 0.06 | 7.517 | 0.06 | 8.483 | 0.06 | 9.45 | 0.08 | 10.42 | 0.06 | 11.38 | |
| 6.567 | 0.07 | 7.533 | 0.07 | 8.5 | 0.05 | 9.467 | 0.07 | 10.43 | 0.07 | 11.4 | |
| 6.583 | 0.07 | 7.55 | 0.07 | 8.517 | 0.05 | 9.483 | 0.06 | 10.45 | 0.06 | 11.42 | |
| 6.6 | 0.06 | 7.567 | 0.06 | 8.533 | 0.08 | 9.5 | 0.07 | 10.47 | 0.05 | 11.43 | |
| 6.617 | 0.06 | 7.583 | 0.06 | 8.55 | 0.08 | 9.517 | 0.07 | 10.48 | 0.05 | 11.45 | |
| 6.633 | 0.06 | 7.6 | 0.06 | 8.567 | 0.08 | 9.533 | 0.06 | 10.5 | 0.08 | 11.47 | |
| 6.65 | 0.07 | 7.617 | 0.07 | 8.583 | 0.07 | 9.55 | 0.06 | 10.52 | 0.08 | 11.48 | |
| 6.667 | 0.09 | 7.633 | 0.09 | 8.6 | 0.07 | 9.567 | 0.06 | 10.53 | 0.08 | 11.5 | |
| 6.683 | 0.08 | 7.65 | 0.08 | 8.617 | 0.07 | 9.583 | 0.07 | 10.55 | 0.07 | 11.52 | |
| 6.7 | 0.07 | 7.667 | 0.07 | 8.633 | 0.08 | 9.6 | 0.06 | 10.57 | 0.07 | 11.53 | |
| 6.717 | 0.08 | 7.683 | 0.08 | 8.65 | 0.07 | 9.617 | 0.07 | 10.58 | 0.07 | 11.55 | |
| 6.733 | 0.07 | 7.7 | 0.07 | 8.667 | 0.06 | 9.633 | 0.06 | 10.6 | 0.08 | 11.57 | |
| 6.75 | 0.07 | 7.717 | 0.07 | 8.683 | 0.07 | 9.65 | 0.05 | 10.62 | 0.07 | 11.58 | |
| 6.767 | 0.07 | 7.733 | 0.07 | 8.7 | 0.07 | 9.667 | 0.05 | 10.63 | 0.06 | 11.6 | |
| 6.783 | 0.07 | 7.75 | 0.07 | 8.717 | 0.06 | 9.683 | 0.08 | 10.65 | 0.07 | 11.62 | |
| 6.8 | 0.06 | 7.767 | 0.06 | 8.733 | 0.06 | 9.7 | 0.08 | 10.67 | 0.07 | 11.63 | |
| 6.817 | 0.06 | 7.783 | 0.06 | 8.75 | 0.06 | 9.717 | 0.08 | 10.68 | 0.06 | 11.65 | |
| 6.833 | 0.07 | 7.8 | 0.07 | 8.767 | 0.07 | 9.733 | 0.07 | 10.7 | 0.06 | 11.67 | |
| 6.85 | 0.06 | 7.817 | 0.06 | 8.783 | 0.09 | 9.75 | 0.07 | 10.72 | 0.06 | 11.68 | |
| 6.867 | 0.05 | 7.833 | 0.05 | 8.8 | 0.08 | 9.767 | 0.07 | 10.73 | 0.07 | 11.7 | |
| 6.883 | 0.05 | 7.85 | 0.05 | 8.817 | 0.07 | 9.783 | 0.08 | 10.75 | 0.06 | 11.72 | |
| 6.9 | 0.08 | 7.867 | 0.07 | 8.833 | 0.08 | 9.8 | 0.07 | 10.77 | 0.07 | 11.73 | |
| 6.917 | 0.08 | 7.883 | 0.07 | 8.85 | 0.07 | 9.817 | 0.06 | 10.78 | 0.06 | 11.75 | |
| 6.933 | 0.08 | 7.9 | 0.06 | 8.867 | 0.07 | 9.833 | 0.07 | 10.8 | 0.05 | 11.77 | |
| 6.95 | 0.07 | 7.917 | 0.06 | 8.883 | 0.07 | 9.85 | 0.07 | 10.82 | 0.05 | 11.78 | |
| 6.967 | 0.07 | 7.933 | 0.06 | 8.9 | 0.07 | 9.867 | 0.06 | 10.83 | | 11.8 | |
| 6.983 | 0.07 | 7.95 | 0.07 | 8.917 | 0.06 | 9.883 | 0.06 | 10.85 | | 11.82 | |
| 7 | 0.08 | 7.967 | 0.09 | 8.933 | 0.06 | 9.9 | 0.06 | 10.87 | | 11.83 | |
| 7.017 | 0.07 | 7.983 | 0.08 | 8.95 | 0.07 | 9.917 | 0.07 | 10.88 | | 11.85 | |
| 7.033 | 0.06 | 8 | 0.07 | 8.967 | 0.06 | 9.933 | 0.09 | 10.9 | | 11.87 | |
| 7.05 | 0.07 | 8.017 | 0.08 | 8.983 | 0.05 | 9.95 | 0.08 | 10.92 | | 11.88 | |
| 7.067 | 0.07 | 8.033 | 0.07 | 9 | 0.05 | 9.967 | 0.07 | 10.93 | | 11.9 | |
| 7.083 | 0.06 | 8.05 | 0.07 | 9.017 | 0.07 | 9.983 | 0.08 | 10.95 | | 11.92 | |
| 7.1 | 0.06 | 8.067 | 0.07 | 9.033 | 0.07 | 10 | 0.07 | 10.97 | | 11.93 | |
| 7.117 | 0.06 | 8.083 | 0.07 | 9.05 | 0.06 | 10.02 | 0.07 | 10.98 | | 11.95 | |
| 7.133 | 0.07 | 8.1 | 0.06 | 9.067 | 0.06 | 10.03 | 0.07 | 11 | | 11.97 | |
| 7.15 | 0.09 | 8.117 | 0.06 | 9.083 | 0.06 | 10.05 | 0.07 | 11.02 | | 11.98 | |
| 7.167 | 0.08 | 8.133 | 0.07 | 9.1 | 0.07 | 10.07 | 0.06 | 11.03 | | 12 | |
| 7.183 | 0.07 | 8.15 | 0.06 | 9.117 | 0.09 | 10.08 | 0.06 | 11.05 | | | |
| 7.2 | 0.08 | 8.167 | 0.05 | 9.133 | 0.08 | 10.1 | 0.07 | 11.07 | | | |

| Calibration No Carbon Cycle Evolution DO | | | | | | | |
|--|-----------|----------|-----------|----------|-----------|----------|-----------|
| Simulation | | | | | | | |
| Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) |
| 16.000 | 0.627 | 21.000 | 0.004 | 22.000 | 0.011 | 28.000 | 0.011 |
| 16.010 | 0.625 | 21.010 | 0.647 | 22.010 | 0.587 | 28.010 | 0.599 |
| 16.020 | 0.627 | 21.020 | 0.639 | 22.020 | 0.586 | 28.020 | 0.593 |
| 16.030 | 0.646 | 21.030 | 0.660 | 22.030 | 0.586 | 28.030 | 0.603 |
| 16.040 | 0.776 | 21.040 | 0.683 | 22.040 | 0.595 | 28.040 | 0.624 |
| 16.050 | 0.810 | 21.050 | 0.686 | 22.050 | 0.657 | 28.050 | 0.626 |
| 16.060 | 0.812 | 21.060 | 0.688 | 22.060 | 0.708 | 28.060 | 0.629 |
| 16.070 | 0.815 | 21.070 | 0.691 | 22.070 | 0.710 | 28.070 | 0.631 |
| 16.080 | 0.817 | 21.080 | 0.693 | 22.080 | 0.712 | 28.080 | 0.633 |
| 16.090 | 0.819 | 21.090 | 0.695 | 22.090 | 0.714 | 28.090 | 0.636 |
| 16.100 | 0.821 | 21.100 | 0.698 | 22.100 | 0.716 | 28.100 | 0.639 |
| 16.110 | 0.823 | 21.110 | 0.700 | 22.110 | 0.718 | 28.110 | 0.642 |
| 16.121 | 0.825 | 21.120 | 0.702 | 22.120 | 0.721 | 28.120 | 0.645 |
| 16.130 | 0.827 | 21.130 | 0.705 | 22.130 | 0.724 | 28.130 | 0.650 |
| 16.140 | 0.829 | 21.140 | 0.708 | 22.140 | 0.727 | 28.140 | 0.656 |
| 16.150 | 0.831 | 21.150 | 0.711 | 22.150 | 0.731 | 28.150 | 0.665 |
| 16.160 | 0.833 | 21.160 | 0.715 | 22.160 | 0.736 | 28.160 | 0.678 |
| 16.170 | 0.835 | 21.170 | 0.720 | 22.170 | 0.742 | 28.170 | 0.701 |
| 16.180 | 0.837 | 21.180 | 0.726 | 22.180 | 0.750 | 28.180 | 0.751 |
| 16.190 | 0.840 | 21.190 | 0.734 | 22.190 | 0.761 | 28.190 | 0.928 |
| 16.200 | 0.843 | 21.200 | 0.745 | 22.200 | 0.778 | 28.200 | 4.503 |
| 16.210 | 0.847 | 21.210 | 0.763 | 22.210 | 0.808 | 28.210 | 7.336 |
| 16.220 | 0.851 | 21.220 | 0.793 | 22.220 | 0.872 | 28.220 | 7.352 |
| 16.230 | 0.857 | 21.230 | 0.856 | 22.230 | 1.083 | 28.230 | 7.353 |
| 16.240 | 0.863 | 21.240 | 1.063 | 22.240 | 3.771 | 28.240 | 7.354 |
| 16.250 | 0.003 | 21.250 | 3.360 | 22.250 | 7.223 | 28.250 | 7.355 |
| 16.260 | 0.003 | 21.260 | 0.019 | 22.260 | 3.845 | 28.260 | 3.840 |
| 16.270 | 0.003 | 21.270 | 0.015 | 22.270 | 1.043 | 28.270 | 0.921 |
| 16.280 | 0.003 | 21.280 | 0.014 | 22.280 | 0.020 | 28.280 | 0.019 |
| 16.290 | 0.003 | 21.290 | 0.013 | 22.290 | 0.014 | 28.290 | 0.016 |
| 16.301 | 0.003 | 21.301 | 0.013 | 22.300 | 0.013 | 28.300 | 0.014 |
| 16.310 | 0.003 | 21.310 | 0.012 | 22.310 | 0.012 | 28.310 | 0.013 |
| 16.320 | 0.003 | 21.320 | 0.012 | 22.320 | 0.012 | 28.320 | 0.012 |
| 16.331 | 0.003 | 21.330 | 0.011 | 22.330 | 0.011 | 28.330 | 0.011 |
| 16.340 | 0.003 | 21.341 | 0.011 | 22.341 | 0.011 | 28.341 | 0.011 |
| 16.350 | 0.003 | 21.351 | 0.011 | 22.351 | 0.011 | 28.351 | 0.011 |
| 16.360 | 0.003 | 21.361 | 0.011 | 22.361 | 0.011 | 28.361 | 0.011 |
| 16.370 | 0.003 | 21.371 | 0.011 | 22.371 | 0.011 | 28.371 | 0.011 |
| 16.380 | 0.003 | 21.381 | 0.011 | 22.381 | 0.011 | 28.381 | 0.011 |
| 16.390 | 0.003 | 21.391 | 0.011 | 22.391 | 0.011 | 28.391 | 0.011 |
| 16.400 | 0.003 | 21.401 | 0.011 | 22.401 | 0.011 | 28.401 | 0.011 |
| 16.410 | 0.003 | 21.411 | 0.011 | 22.411 | 0.011 | 28.411 | 0.011 |
| 16.420 | 0.003 | 21.421 | 0.011 | 22.421 | 0.011 | 28.421 | 0.011 |
| 16.430 | 0.003 | 21.431 | 0.011 | 22.431 | 0.011 | 28.431 | 0.011 |
| 16.440 | 0.003 | 21.441 | 0.011 | 22.441 | 0.011 | 28.441 | 0.011 |
| 16.450 | 0.003 | 21.451 | 0.011 | 22.451 | 0.011 | 28.451 | 0.011 |
| 16.461 | 0.003 | 21.461 | 0.011 | 22.461 | 0.011 | 28.461 | 0.011 |
| 16.471 | 0.003 | 21.471 | 0.011 | 22.471 | 0.011 | 28.471 | 0.011 |
| 16.481 | 0.003 | 21.481 | 0.011 | 22.481 | 0.011 | 28.481 | 0.011 |
| 16.491 | 0.003 | 21.491 | 0.011 | 22.491 | 0.011 | 28.491 | 0.011 |
| 16.500 | 0.010 | | 0.011 | 22.500 | 0.011 | 28.500 | 0.011 |

| Validation no Carbon Long term evolution SBD Outlet | | | | | | | |
|---|---------|---------|---------|--------|-----|------|-----|
| Time (d) | Sim | | | Exp | | | |
| | NH4 | NO2 | NO3 | NH4 | NO2 | NO3 | COD |
| 1 | 216.753 | 256.164 | 11.9331 | 181 | 302 | 16.5 | 868 |
| 2 | 235.497 | 299.884 | 2.65097 | | | | |
| 3 | 198.603 | 339.932 | 3.34792 | 197.25 | 392 | 5.8 | 876 |
| 4 | 155.999 | 381.934 | 4.34915 | | | | |
| 5 | 112.713 | 424.669 | 5.20959 | 108 | 441 | 8.1 | 885 |
| 6 | 69.7257 | 467.304 | 5.88112 | | | | |
| 7 | 27.4671 | 509.33 | 6.62136 | 34.75 | 521 | 21.6 | 905 |
| 8 | 0.53547 | 533.266 | 13.0049 | | | | |
| 9 | 0.52382 | 528.767 | 20.2706 | 1.25 | 515 | 35.2 | 893 |
| 10 | 0.51336 | 525.421 | 25.4089 | 0.6 | 529 | 32.1 | 0 |

| Validation no Carbon Cycle Evolution Nutrient | | | | | | | | | |
|---|--------------|---------------|---------------|------|-------|------|-----|------|-----|
| Time d | Sim | | | Exp | | | | | |
| | S_NH g/m3 | S_NO2 g/m3 | S_NO3 g/m3 | pH | CaCO3 | NH4 | NO2 | NO3 | COD |
| 8.000 | 0.529 | 530.780 | 17.123 | 8.65 | 3000 | 328 | 282 | 5.8 | 673 |
| 8.010 | 344.132 | 224.982 | 6.203 | | | | | | |
| 8.020 | 329.292 | 236.569 | 4.782 | | | | | | |
| 8.030 | 314.364 | 248.708 | 3.785 | | | | | | |
| 8.040 | 298.185 | 263.695 | 4.144 | 0 | 0 | 289 | 301 | 7.1 | 702 |
| 8.050 | 281.873 | 278.877 | 4.546 | | | | | | |
| 8.060 | 265.743 | 293.910 | 4.946 | | | | | | |
| 8.070 | 249.539 | 309.035 | 5.351 | | | | | | |
| 8.080 | 233.343 | 324.170 | 5.759 | 0 | 0 | 206 | 349 | 9.7 | 744 |
| 8.090 | 216.926 | 339.530 | 6.175 | | | | | | |
| 8.100 | 200.698 | 354.731 | 6.589 | | | | | | |
| 8.110 | 184.441 | 369.973 | 7.007 | | | | | | |
| 8.120 | 168.262 | 385.158 | 7.425 | 0 | 0 | 178 | 391 | 15.6 | 789 |
| 8.130 | 151.996 | 400.436 | 7.849 | | | | | | |
| 8.140 | 135.538 | 415.907 | 8.282 | | | | | | |
| 8.150 | 119.312 | 431.170 | 8.712 | | | | | | |
| 8.160 | 102.818 | 446.696 | 9.153 | 0 | 0 | 71 | 440 | 17.9 | 823 |
| 8.170 | 86.565 | 462.003 | 9.593 | | | | | | |
| 8.180 | 70.105 | 477.512 | 10.045 | | | | | | |
| 8.190 | 53.815 | 492.866 | 10.501 | | | | | | |
| 8.200 | 37.538 | 508.208 | 10.970 | 0 | 0 | 23 | 489 | 20.2 | 851 |
| 8.210 | 21.192 | 523.608 | 11.471 | | | | | | |
| 8.220 | 5.237 | 538.577 | 12.069 | | | | | | |
| 8.230 | 0.008 | 541.862 | 14.011 | | | | | | |
| 8.240 | 0.008 | 539.378 | 16.641 | 8.72 | 1000 | 1.25 | 554 | 24.3 | 879 |
| 8.250 | 0.008 | 537.206 | 18.941 | | | | | | |
| 8.260 | 0.011 | 535.105 | 21.155 | | | | | | |
| 8.270 | 0.060 | 534.111 | 21.739 | | | | | | |
| 8.280 | 0.145 | 533.227 | 21.500 | | | | | | |
| 8.290 | 0.221 | 532.377 | 21.267 | 0 | 0 | 1.25 | 533 | 26.8 | 919 |
| 8.300 | 0.293 | 531.535 | 21.035 | | | | | | |
| 8.310 | 0.364 | 530.685 | 20.800 | | | | | | |
| 8.320 | 0.433 | 529.863 | 20.573 | | | | | | |
| 8.330 | 0.501 | 529.040 | 20.346 | 8.59 | 840 | 1.4 | 529 | 35.2 | 905 |
| 8.341 | 0.523 | 528.767 | 20.271 | | | | | | |
| 8.351 | 0.523 | 528.767 | 20.271 | | | | | | |
| 8.361 | 0.523 | 528.767 | 20.271 | | | | | | |
| 8.371 | 0.523 | 528.767 | 20.271 | 0 | 0 | 1.2 | 529 | 25 | 905 |
| 8.381 | 0.523 | 528.767 | 20.271 | | | | | | |
| 8.391 | 0.523 | 528.767 | 20.271 | | | | | | |
| 8.401 | 0.523 | 528.767 | 20.271 | | | | | | |
| 8.411 | 0.523 | 528.767 | 20.271 | 0 | 0 | 1.2 | 529 | 25 | 905 |
| 8.421 | 0.523 | 528.767 | 20.271 | | | | | | |
| 8.431 | 0.523 | 528.767 | 20.271 | | | | | | |
| 8.441 | 0.523 | 528.767 | 20.271 | | | | | | |
| 8.451 | 0.523 | 528.767 | 20.271 | 0 | 0 | 1.2 | 529 | 25 | 905 |
| 8.461 | 0.523 | 528.767 | 20.271 | | | | | | |
| 8.471 | 0.523 | 528.767 | 20.271 | | | | | | |
| 8.481 | 0.523 | 528.767 | 20.271 | | | | | | |
| 8.491 | 0.523 | 528.767 | 20.271 | 0 | 0 | 1.2 | 529 | 25 | 905 |
| 8.500 | 0.711 | 526.975 | 16.186 | 8.36 | 3100 | 336 | 232 | 5.4 | 650 |

| Validation no Carbon Cycle Evolution Nutrient | | | | | | | | | |
|---|--------------|---------------|---------------|------|-------|------|-------|------|-----|
| Time d | Sim | | | Exp | | | | | |
| | S_NH g/m3 | S_NO2 g/m3 | S_NO3 g/m3 | pH | CaCO3 | NH4 | NO2 | NO3 | COD |
| 9.000 | 0.700 | 525.114 | 19.016 | | | | | | |
| 9.010 | 344.212 | 221.941 | 5.935 | | | | | | |
| 9.020 | 329.104 | 232.924 | 3.827 | | | | | | |
| 9.030 | 312.624 | 247.259 | 3.443 | 0 | 0 | 298 | 301 | 7.9 | 713 |
| 9.040 | 295.655 | 263.049 | 3.843 | | | | | | |
| 9.050 | 278.481 | 279.059 | 4.251 | | | | | | |
| 9.060 | 261.198 | 295.197 | 4.664 | | | | | | |
| 9.070 | 244.243 | 311.053 | 5.073 | 8.27 | 2000 | 189 | 367.5 | 12.2 | 766 |
| 9.080 | 227.034 | 327.169 | 5.491 | | | | | | |
| 9.090 | 209.690 | 343.433 | 5.915 | | | | | | |
| 9.100 | 192.634 | 359.446 | 6.334 | | | | | | |
| 9.110 | 175.362 | 375.679 | 6.763 | 0 | 0 | 151 | 409 | 13.6 | 801 |
| 9.120 | 158.027 | 391.988 | 7.196 | | | | | | |
| 9.130 | 140.785 | 408.224 | 7.630 | | | | | | |
| 9.140 | 123.550 | 424.467 | 8.068 | | | | | | |
| 9.150 | 106.080 | 440.943 | 8.516 | 8.15 | 1200 | 48.5 | 521 | 16.5 | 853 |
| 9.160 | 88.917 | 457.141 | 8.962 | | | | | | |
| 9.170 | 71.605 | 473.486 | 9.418 | | | | | | |
| 9.180 | 54.227 | 489.901 | 9.885 | | | | | | |
| 9.190 | 36.947 | 506.225 | 10.365 | 8.38 | 920 | 5.5 | 548 | 21.3 | 896 |
| 9.200 | 19.757 | 522.456 | 10.877 | | | | | | |
| 9.210 | 3.117 | 538.071 | 11.532 | | | | | | |
| 9.220 | 0.009 | 539.097 | 13.707 | | | | | | |
| 9.230 | 0.009 | 536.642 | 16.347 | 8.74 | 920 | 5.2 | 523 | 22.4 | 877 |
| 9.240 | 0.009 | 534.259 | 18.909 | | | | | | |
| 9.250 | 0.009 | 532.091 | 21.240 | | | | | | |
| 9.260 | 0.015 | 530.077 | 23.390 | | | | | | |
| 9.270 | 0.099 | 529.147 | 23.555 | | | | | | |
| 9.280 | 0.200 | 528.225 | 23.249 | 8.69 | 840 | 4.2 | 518 | 28.3 | 897 |
| 9.290 | 0.296 | 527.307 | 22.942 | | | | | | |
| 9.300 | 0.388 | 526.406 | 22.639 | | | | | | |
| 9.310 | 0.480 | 525.499 | 22.333 | | | | | | |
| 9.320 | 0.569 | 524.621 | 22.037 | 8.63 | 840 | 0.6 | 515 | 22.1 | 838 |
| 9.330 | 0.659 | 523.744 | 21.741 | | | | | | |
| 9.341 | 0.688 | 523.453 | 21.643 | | | | | | |
| 9.351 | 0.688 | 523.453 | 21.643 | | | | | | |
| 9.361 | 0.688 | 523.453 | 21.643 | 0 | 0 | 0.7 | 515 | 22.1 | 838 |
| 9.371 | 0.688 | 523.453 | 21.643 | | | | | | |
| 9.381 | 0.688 | 523.453 | 21.643 | | | | | | |
| 9.391 | 0.688 | 523.453 | 21.643 | | | | | | |
| 9.401 | 0.688 | 523.453 | 21.643 | 0 | 0 | 0.6 | 515 | 22.1 | 838 |
| 9.411 | 0.688 | 523.453 | 21.643 | | | | | | |
| 9.421 | 0.688 | 523.453 | 21.643 | | | | | | |
| 9.431 | 0.688 | 523.453 | 21.643 | | | | | | |
| 9.441 | 0.688 | 523.453 | 21.643 | 0 | 0 | 0.6 | 515 | 22.1 | 838 |
| 9.451 | 0.688 | 523.453 | 21.643 | | | | | | |
| 9.461 | 0.688 | 523.453 | 21.643 | | | | | | |
| 9.471 | 0.688 | 523.453 | 21.643 | | | | | | |
| 9.481 | 0.688 | 523.453 | 21.643 | 0 | 0 | 0.6 | 515 | 22.1 | 838 |
| 9.491 | 0.688 | 523.453 | 21.643 | | | | | | |
| 9.500 | 0.688 | 523.453 | 21.643 | | | | | | |

| Validation no Carbon Cycle Evolution DO | | | | | | | | | | | |
|---|-----------|----------|-----------|----------|-----------|----------|-----------|----------|-----------|----------|-----------|
| Exp | | | | | | | | | | | |
| Time (d) | Do (mg/L) | Time (d) | Do (mg/L) | Time (d) | Do (mg/L) | Time (d) | Do (mg/L) | Time (d) | Do (mg/L) | Time (d) | Do (mg/L) |
| 0 | 8.17 | 0.9167 | 0.62 | 1.8333 | 0.62 | 2.75 | 1.04 | 3.6667 | 0.57 | 4.6333 | 0.57 |
| 0.0167 | 8.02 | 0.9333 | 0.6 | 1.85 | 0.57 | 2.7667 | 0.54 | 3.6833 | 0.55 | 4.65 | 0.6 |
| 0.0333 | 5.53 | 0.95 | 0.8 | 1.8667 | 0.74 | 2.7833 | 0.56 | 3.7 | 0.61 | 4.6667 | 0.6 |
| 0.05 | 5.45 | 0.9667 | 0.65 | 1.8833 | 0.61 | 2.8 | 0.58 | 3.7167 | 0.58 | 4.6833 | 0.53 |
| 0.0667 | 3.76 | 0.9833 | 0.57 | 1.9 | 0.58 | 2.8167 | 0.59 | 3.7333 | 0.53 | 4.7 | 0.55 |
| 0.0833 | 1.55 | 1 | 0.98 | 1.9167 | 0.76 | 2.8333 | 0.55 | 3.75 | 0.57 | 4.7167 | 0.64 |
| 0.1 | 1.54 | 1.0167 | 0.86 | 1.9333 | 0.6 | 2.85 | 0.56 | 3.7667 | 0.6 | 4.7333 | 0.49 |
| 0.1167 | 1.38 | 1.0333 | 0.57 | 1.95 | 0.72 | 2.8667 | 0.56 | 3.7833 | 0.6 | 4.75 | 0.54 |
| 0.1333 | 1.58 | 1.05 | 0.74 | 1.9667 | 0.61 | 2.8833 | 0.65 | 3.8 | 0.53 | 4.7667 | 0.57 |
| 0.15 | 1.61 | 1.0667 | 0.6 | 1.9833 | 0.64 | 2.9 | 0.82 | 3.8167 | 0.55 | 4.7833 | 0.61 |
| 0.1667 | 1.61 | 1.0833 | 0.67 | 2 | 0.69 | 2.9167 | 0.78 | 3.8333 | 0.64 | 4.8 | 0.62 |
| 0.1833 | 1.22 | 1.1 | 0.71 | 2.0167 | 0.67 | 2.9333 | 0.6 | 3.85 | 0.49 | 4.8167 | 0.56 |
| 0.2 | 1.58 | 1.1167 | 0.6 | 2.0333 | 0.83 | 2.95 | 0.6 | 3.8667 | 0.54 | 4.8333 | 0.53 |
| 0.2167 | 1.76 | 1 | 0.62 | 2.05 | 0.68 | 2.9667 | 0.54 | 3.8833 | 0.57 | 4.85 | 0.58 |
| 0.2333 | 0.71 | 1.15 | 0.6 | 2.0667 | 0.83 | 2.9833 | 0.54 | 3.9 | 0.61 | 4.8667 | 0.57 |
| 0.25 | 0.6 | 1.1667 | 0.8 | 2.0833 | 0.95 | 3 | 0.57 | 3.9167 | 0.62 | 4.8833 | 0.55 |
| 0.2667 | 0.62 | 1.1833 | 0.65 | 2.1 | 0.82 | 3.0167 | 0.56 | 3.9333 | 0.57 | 4.9 | 0.55 |
| 0.2833 | 0.6 | 1.2 | 0.57 | 2.1167 | 0.72 | 3.0333 | 0.72 | 3.95 | 0.58 | 4.9167 | 0.54 |
| 0.3 | 0.8 | 1.2167 | 0.98 | 2.1333 | 0.71 | 3.05 | 0.54 | 3.9667 | 0.73 | 4.9333 | 0.56 |
| 0.3167 | 0.65 | 1.2333 | 0.86 | 2.15 | 0.7 | 3.0667 | 0.55 | 3.9833 | 0.54 | 4.95 | 0.56 |
| 0.3333 | 0.57 | 1.25 | 0.57 | 2.1667 | 0.76 | 3.0833 | 0.54 | 4 | 0.63 | 4.9667 | 0.63 |
| 0.35 | 0.98 | 1.2667 | 0.74 | 2.1833 | 1.13 | 3.1 | 0.56 | 4.0167 | 0.61 | 4.9833 | 0.62 |
| 0.3667 | 0.86 | 1.2833 | 0.6 | 2.2 | 0.68 | 3.1167 | 0.55 | 4.0333 | 0.58 | 5 | 0.58 |
| 0.3833 | 0.57 | 1.3 | 0.67 | 2.2167 | 0.66 | 3.1333 | 0.56 | 4.05 | 0.53 | 5.0167 | 0.65 |
| 0.4 | 0.74 | 1.3167 | 0.71 | 2.2333 | 0.69 | 3.15 | 0.56 | 4.0667 | 0.64 | 5.0333 | 0.66 |
| 0.4167 | 0.6 | 1.3333 | 0.6 | 2.25 | 0.65 | 3.1667 | 0.55 | 4.0833 | 0.54 | 5.05 | 0.68 |
| 0.4333 | 0.67 | 1.35 | 0.62 | 2.2667 | 0.68 | 3.1833 | 0.58 | 4.1 | 0.61 | 5.0667 | 0.59 |
| 0.45 | 0.63 | 1.3667 | 0.6 | 2.2833 | 0.63 | 3.2 | 0.58 | 4.1167 | 0.62 | 5.0833 | 0.65 |
| 0.4667 | 0.61 | 1.3833 | 0.8 | 2.3 | 0.67 | 3.2167 | 0.56 | 4.1333 | 0.57 | 5.1 | 0.67 |
| 0.4833 | 0.73 | 1.4 | 0.65 | 2.3167 | 0.62 | 3.2333 | 0.67 | 4.15 | 0.61 | 5.1167 | 0.75 |
| 0.5 | 0.62 | 1.4167 | 0.57 | 2.3333 | 0.62 | 3.25 | 0.5 | 4.1667 | 0.58 | 5.1333 | 0.68 |
| 0.5167 | 0.6 | 1.4333 | 0.98 | 2.35 | 0.63 | 3.2667 | 0.53 | 4.1833 | 0.53 | 5.15 | 0.74 |
| 0.5333 | 0.67 | 1.45 | 0.86 | 2.3667 | 0.66 | 3.2833 | 0.67 | 4.2 | 0.57 | 5.1667 | 0.81 |
| 0.55 | 0.59 | 1.4667 | 0.57 | 2.3833 | 0.72 | 3.3 | 0.58 | 4.2167 | 0.6 | 5.1833 | 1 |
| 0.5667 | 0.7 | 1.4833 | 0.74 | 2.4 | 0.65 | 3.3167 | 0.62 | 4.2333 | 0.6 | 5.2 | 1.13 |
| 0.5833 | 0.6 | 1.5 | 0.6 | 2.4167 | 0.59 | 3.3333 | 0.52 | 4.25 | 0.53 | 5.2167 | 1.67 |
| 0.6 | 0.7 | 1.5167 | 0.67 | 2.4333 | 0.64 | 3.35 | 0.53 | 4.2667 | 0.55 | 5.2333 | 1.84 |
| 0.6167 | 0.65 | 1.5333 | 0.88 | 2.45 | 0.59 | 3.3667 | 0.53 | 4.2833 | 0.64 | 5.25 | 2.25 |
| 0.6333 | 0.72 | 1.55 | 0.71 | 2.4667 | 0.75 | 3.3833 | 0.51 | 4.3 | 0.49 | 5.2667 | 2.6 |
| 0.65 | 1.08 | 1.5667 | 0.6 | 2.4833 | 0.68 | 3.4 | 0.52 | 4.3167 | 0.54 | 5.2833 | 3.04 |
| 0.6667 | 0.55 | 1.5833 | 0.63 | 2.5 | 0.87 | 3.4167 | 0.54 | 4.3333 | 0.57 | 5.3 | 3.49 |
| 0.6833 | 0.72 | 1.6 | 0.7 | 2.5167 | 0.59 | 3.4333 | 0.55 | 4.35 | 0.61 | 5.3167 | 3.89 |
| 0.7 | 0.63 | 1.6167 | 0.58 | 2.5333 | 0.58 | 3.45 | 0.55 | 4.3667 | 0.62 | 5.3333 | 4.26 |
| 0.7167 | 0.57 | 1.6333 | 0.67 | 2.55 | 0.61 | 3.4667 | 0.57 | 4.3833 | 0.54 | 5.35 | 4.6 |
| 0.7333 | 0.57 | 1.65 | 0.83 | 2.5667 | 0.57 | 3.4833 | 0.63 | 4.4 | 0.52 | 5.3667 | 4.92 |
| 0.75 | 0.56 | 1.6667 | 0.61 | 2.5833 | 0.55 | 3.5 | 0.54 | 4.4167 | 0.54 | 5.3833 | 5.19 |
| 0.7667 | 0.81 | 1.6833 | 0.62 | 2.6 | 0.56 | 3.5167 | 0.52 | 4.4333 | 0.58 | 5.4 | 5.53 |
| 0.7833 | 0.57 | 1.7 | 0.59 | 2.6167 | 0.62 | 3.5333 | 0.54 | 4.45 | 0.53 | 5.4167 | 5.77 |
| 0.8 | 0.74 | 1.7167 | 0.75 | 2.6333 | 0.67 | 3.55 | 0.58 | 4.4667 | 0.56 | 5.4333 | 6.02 |
| 0.8167 | 0.75 | 1.7333 | 1.15 | 2.65 | 0.64 | 3.5667 | 0.53 | 4.4833 | 0.57 | 5.45 | 6.22 |
| 0.8333 | 0.79 | 1.75 | 0.63 | 2.6667 | 0.68 | 3.5833 | 0.56 | 4.5 | 0.52 | 5.4667 | 6.41 |
| 0.85 | 0.73 | 1.7667 | 0.61 | 2.6833 | 0.56 | 3.6 | 0.57 | 4.5167 | 0.83 | 5.4833 | 6.56 |
| 0.8667 | 0.79 | 6420 | 1.7833 | 2.7 | 0.55 | 3.6167 | 0.52 | 4.5333 | 0.59 | 5.5 | 6.71 |
| 0.8833 | 0.71 | 6480 | 1.8 | 2.7167 | 0.54 | 3.6333 | 0.83 | 4.55 | 0.57 | 5.5167 | 6.72 |

| Time (d) | Do (mg/L) | Time (d) | Do (mg/L) | Time (d) | Do (mg/L) | Time (d) | Do (mg/L) | Time (d) | Do (mg/L) | Time (d) | Do (mg/L) |
|----------|-----------|----------|-----------|----------|-----------|----------|-----------|----------|-----------|----------|-----------|
| 5.6 | 7.18 | 6.5667 | 0.39 | 7.5333 | 0.07 | 8.5 | 0.07 | 9.4667 | 0.06 | 10.433 | 0 |
| 5.6167 | 7.23 | 6.5833 | 0.24 | 7.55 | 0.06 | 8.5167 | 0.07 | 9.4833 | 0.07 | 10.45 | 0 |
| 5.6333 | 7.23 | 6.6 | 0.13 | 7.5667 | 0.06 | 8.5333 | 0.07 | 9.5 | 0.07 | 10.467 | 0 |
| 5.65 | 7.34 | 6.6167 | 0.09 | 7.5833 | 0.06 | 8.55 | 0.07 | 9.5167 | 0.06 | 10.483 | 0 |
| 5.6667 | 7.3 | 6.6333 | 0.09 | 7.6 | 0.07 | 8.5667 | 0.06 | 9.5333 | 0.06 | 10.5 | 0 |
| 5.6833 | 7.37 | 6.65 | 0.09 | 7.6167 | 0.09 | 8.5833 | 0.06 | 9.55 | 0.06 | 10.517 | 0 |
| 5.7 | 7.36 | 6.6667 | 0.08 | 7.6333 | 0.08 | 8.6 | 0.07 | 9.5667 | 0.07 | 10.533 | 0 |
| 5.7167 | 7.33 | 6.6833 | 0.07 | 7.65 | 0.07 | 8.6167 | 0.06 | 9.5833 | 0.09 | 10.55 | 0 |
| 5.7333 | 7.42 | 6.7 | 0.08 | 7.6667 | 0.08 | 8.6333 | 0.05 | 9.6 | 0.08 | 10.567 | 0 |
| 5.75 | 7.42 | 6.7167 | 0.07 | 7.6833 | 0.07 | 8.65 | 0.05 | 9.6167 | 0.07 | 10.583 | 0 |
| 5.7667 | 7.45 | 6.7333 | 0.07 | 7.7 | 0.07 | 8.6667 | 0.07 | 9.6333 | 0.08 | 10.6 | 0 |
| 5.7833 | 7.45 | 6.75 | 0.07 | 7.7167 | 0.07 | 8.6833 | 0.07 | 9.65 | 0.07 | 10.617 | 0 |
| 5.8 | 7.44 | 6.7667 | 0.07 | 7.7333 | 0.07 | 8.7 | 0.06 | 9.6667 | 0.07 | 10.633 | 0 |
| 5.8167 | 7.44 | 6.7833 | 0.06 | 7.75 | 0.06 | 8.7167 | 0.06 | 9.6833 | 0.07 | 10.65 | 0 |
| 5.8333 | 7.47 | 6.8 | 0.06 | 7.7667 | 0.06 | 8.7333 | 0.06 | 9.7 | 0.07 | 10.667 | 0 |
| 5.85 | 7.28 | 6.8167 | 0.07 | 7.7833 | 0.07 | 8.75 | 0.07 | 9.7167 | 0.06 | 10.683 | 0 |
| 5.8667 | 7.31 | 6.8333 | 0.06 | 7.8 | 0.06 | 8.7667 | 0.09 | 9.7333 | 0.06 | 10.7 | 0 |
| 5.8833 | 7.29 | 6.85 | 0.05 | 7.8167 | 0.05 | 8.7833 | 0.08 | 9.75 | 0.07 | 10.717 | 0 |
| 5.9 | 7.27 | 6.8667 | 0.05 | 7.8333 | 0.05 | 8.8 | 0.07 | 9.7667 | 0.06 | 10.733 | 0 |
| 5.9167 | 7.31 | 6.8833 | 0.08 | 7.85 | 0.08 | 8.8167 | 0.08 | 9.7833 | 0.05 | 10.75 | 0 |
| 5.9333 | 7.32 | 6.9 | 0.08 | 7.8667 | 0.08 | 8.8333 | 0.07 | 9.8 | 0.05 | 10.767 | 0 |
| 5.95 | 7.29 | 6.9167 | 0.08 | 7.8833 | 0.08 | 8.85 | 0.07 | 9.8167 | 0.07 | 10.783 | 0 |
| 5.9667 | 7.27 | 6.9333 | 0.07 | 7.9 | 0.07 | 8.8667 | 0.07 | 9.8333 | 0.07 | 10.8 | 0 |
| 5.9833 | 7.29 | 6.95 | 0.07 | 7.9167 | 0.07 | 8.8833 | 0.07 | 9.85 | 0.06 | 10.817 | 0 |
| 6 | 7.29 | 6.9667 | 0.07 | 7.9333 | 0.07 | 8.9 | 0.06 | 9.8667 | 0.06 | 10.833 | 0 |
| 6.0167 | 7.3 | 6.9833 | 0.08 | 7.95 | 0.08 | 8.9167 | 0.06 | 9.8833 | 0.06 | 10.85 | 0 |
| 6.0333 | 7.31 | 7 | 0.07 | 7.9667 | 0.07 | 8.9333 | 0.07 | 9.9 | 0.07 | 10.867 | 0 |
| 6.05 | 7.33 | 7.0167 | 0.06 | 7.9833 | 0.06 | 8.95 | 0.06 | 9.9167 | 0.09 | 10.883 | 0 |
| 6.0667 | 7.31 | 7.0333 | 0.07 | 8 | 0.07 | 8.9667 | 0.05 | 9.9333 | 0.08 | 10.9 | 0 |
| 6.0833 | 7.33 | 7.05 | 0.07 | 8.0167 | 0.07 | 8.9833 | 0.05 | 9.95 | 0.07 | 10.917 | 0 |
| 6.1 | 7.33 | 7.0667 | 0.06 | 8.0333 | 0.06 | 9 | 0.08 | 9.9667 | 0.08 | 10.933 | 0 |
| 6.1167 | 7.3 | 7.0833 | 0.06 | 8.05 | 0.06 | 9.0167 | 0.08 | 9.9833 | 0.07 | 10.95 | 0 |
| 6.1333 | 7.3 | 7.1 | 0.06 | 8.0667 | 0.06 | 9.0333 | 0.08 | 10 | 0.06 | 10.967 | 0 |
| 6.15 | 7.28 | 7.1167 | 0.07 | 8.0833 | 0.07 | 9.05 | 0.07 | 10.017 | 0.06 | 10.983 | 0 |
| 6.1667 | 7.31 | 7.1333 | 0.09 | 8.1 | 0.06 | 9.0667 | 0.07 | 10.033 | 0.07 | 11 | 0 |
| 6.1833 | 7.33 | 7.15 | 0.08 | 8.1167 | 0.07 | 9.0833 | 0.07 | 10.05 | 0.06 | 11.017 | 0 |
| 6.2 | 7.14 | 7.1667 | 0.07 | 8.1333 | 0.06 | 9.1 | 0.08 | 10.067 | 0.05 | 11.033 | 0 |
| 6.2167 | 6.82 | 7.1833 | 0.08 | 8.15 | 0.05 | 9.1167 | 0.07 | 10.083 | 0.05 | 11.05 | 0 |
| 6.2333 | 6.37 | 7.2 | 0.07 | 8.1667 | 0.05 | 9.1333 | 0.06 | 10.1 | 0.08 | 11.067 | 0 |
| 6.25 | 5.95 | 7.2167 | 0.07 | 8.1833 | 0.08 | 9.15 | 0.07 | 10.117 | 0.08 | 11.083 | 0 |
| 6.2667 | 5.64 | 7.2333 | 0.07 | 8.2 | 0.08 | 9.1667 | 0.07 | 10.133 | 0.08 | 11.1 | 0 |
| 6.2833 | 5.52 | 7.25 | 0.07 | 8.2167 | 0.08 | 9.1833 | 0.06 | 10.15 | 0.07 | 11.117 | 0 |
| 6.3 | 5.08 | 7.2667 | 0.06 | 8.2333 | 0.07 | 9.2 | 0.06 | 10.167 | 0.07 | 11.133 | 0 |
| 6.3167 | 4.66 | 7.2833 | 0.06 | 8.25 | 0.07 | 9.2167 | 0.06 | 10.183 | 0.07 | 11.15 | 0 |
| 6.3333 | 4.27 | 7.3 | 0.07 | 8.2667 | 0.07 | 9.2333 | 0.07 | 10.2 | 0.08 | 11.167 | 0 |
| 6.35 | 3.93 | 7.3167 | 0.06 | 8.2833 | 0.08 | 9.25 | 0.06 | 10.217 | 0.07 | 11.183 | 0 |
| 6.3667 | 3.58 | 7.3333 | 0.05 | 8.3 | 0.07 | 9.2667 | 0.07 | 10.233 | 0.06 | 11.2 | 0 |
| 6.3833 | 3.26 | 7.35 | 0.05 | 8.3167 | 0.06 | 9.2833 | 0.06 | 10.25 | 0.07 | 11.217 | 0 |
| 6.4 | 2.91 | 7.3667 | 0.08 | 8.3333 | 0.07 | 9.3 | 0.05 | 10.267 | 0.07 | 11.233 | 0 |
| 6.4167 | 2.6 | 7.3833 | 0.08 | 8.35 | 0.07 | 9.3167 | 0.05 | 10.283 | 0.06 | 11.25 | 0 |
| 6.4333 | 2.32 | 7.4 | 0.08 | 8.3667 | 0.06 | 9.3333 | 0.08 | 10.3 | 0.06 | 11.267 | 0 |
| 6.45 | 2.05 | 7.4167 | 0.07 | 8.3833 | 0.06 | 9.35 | 0.08 | 10.317 | 0.06 | 11.283 | 0 |
| 6.4667 | 1.78 | 7.4333 | 0.07 | 8.4 | 0.06 | 9.3667 | 0.08 | 10.333 | 0.07 | 11.3 | 0 |
| 6.4833 | 1.52 | 7.45 | 0.07 | 8.4167 | 0.07 | 9.3833 | 0.07 | 10.35 | 0.06 | 11.317 | 0 |
| 6.5 | 1.24 | 7.4667 | 0.08 | 8.4333 | 0.09 | 9.4 | 0.07 | 10.367 | 0.07 | 11.333 | 0 |
| 6.5167 | 0.98 | 7.4833 | 0.07 | 8.45 | 0.08 | 9.4167 | 0.07 | 10.383 | 0.06 | 11.35 | 0 |
| 6.5333 | 0.77 | 7.5 | 0.06 | 8.4667 | 0.07 | 9.4333 | 0.08 | 10.4 | 0.05 | 11.367 | 0 |

| Validation no Carbon Cycle Evolution DO | |
|---|-----------|
| Sim | |
| Time (d) | DO (mg/L) |
| 8.000 | 0.006 |
| 8.010 | 0.382 |
| 8.020 | 0.380 |
| 8.030 | 0.391 |
| 8.040 | 0.396 |
| 8.050 | 0.397 |
| 8.060 | 0.398 |
| 8.070 | 0.399 |
| 8.080 | 0.400 |
| 8.090 | 0.401 |
| 8.100 | 0.403 |
| 8.110 | 0.404 |
| 8.120 | 0.405 |
| 8.130 | 0.406 |
| 8.140 | 0.408 |
| 8.150 | 0.410 |
| 8.160 | 0.412 |
| 8.170 | 0.416 |
| 8.180 | 0.420 |
| 8.190 | 0.428 |
| 8.200 | 0.441 |
| 8.210 | 0.476 |
| 8.220 | 0.717 |
| 8.230 | 7.598 |
| 8.240 | 7.679 |
| 8.250 | 7.680 |
| 8.260 | 2.371 |
| 8.270 | 0.013 |
| 8.280 | 0.010 |
| 8.290 | 0.009 |
| 8.300 | 0.008 |
| 8.310 | 0.007 |
| 8.320 | 0.007 |
| 8.330 | 0.006 |
| 8.341 | 0.006 |
| 8.351 | 0.006 |
| 8.361 | 0.006 |
| 8.371 | 0.006 |
| 8.381 | 0.006 |
| 8.391 | 0.006 |
| 8.401 | 0.006 |
| 8.411 | 0.006 |
| 8.421 | 0.006 |
| 8.431 | 0.006 |
| 8.441 | 0.006 |
| 8.451 | 0.006 |
| 8.461 | 0.006 |
| 8.471 | 0.006 |
| 8.481 | 0.006 |
| 8.491 | 0.006 |
| 8.500 | 0.005 |

| Calibration Carbon Longterm Evolution Beginning of Cycle | | | | | | | | | |
|--|--------|-------|-------|-----------|-------|-------|-------|-----------|------------------|
| Time (d) | Sim | | | | Exp | | | | |
| | S_NH | S_NO2 | S_NO3 | SND ratio | S_NH | S_NO2 | S_NO3 | SND ratio | NO2 accumulation |
| 0.25 | 227.50 | 1.30 | 0.04 | 0.83 | | | | | |
| 1.25 | 344.78 | 44.37 | 0.34 | 0.45 | 344 | 56 | 4.1 | 0.3925 | 0.51 |
| 2.25 | 373.70 | 44.00 | 0.28 | 0.39 | | | | | |
| 3.25 | 376.77 | 44.20 | 0.26 | 0.50 | | | | | |
| 4.25 | 372.98 | 44.21 | 0.21 | 0.55 | | | | | |
| 5.25 | 367.16 | 44.30 | 0.14 | 0.59 | 340 | 48 | 2.1 | 0.7364 | 0.92 |
| 6.25 | 360.76 | 44.53 | 0.08 | 0.61 | | | | | |
| 7.25 | 354.21 | 44.81 | 0.02 | 0.63 | | | | | |
| 8.25 | 347.66 | 45.08 | 0.03 | 0.65 | | | | | |
| 9.25 | 341.13 | 45.35 | 0.09 | 0.66 | 328 | 57.5 | 4.7 | 0.6746 | 0.97 |
| 10.25 | 334.62 | 45.61 | 0.14 | 0.68 | | | | | |
| 11.25 | 328.11 | 45.86 | 0.18 | 0.68 | | | | | |
| 12.25 | 321.59 | 46.12 | 0.22 | 0.69 | 320 | 66.5 | 4.3 | 0.6782 | 0.99 |
| 13.25 | 315.06 | 46.37 | 0.26 | 0.70 | | | | | |
| 14.25 | 308.50 | 46.64 | 0.30 | 0.70 | | | | | |
| 15.25 | 301.92 | 46.90 | 0.34 | 0.71 | 312 | 70.75 | 5.1 | 0.7039 | 1.01 |
| 16.25 | 295.34 | 47.18 | 0.39 | 0.71 | | | | | |
| 17.25 | 289.13 | 47.47 | 0.45 | 0.70 | 304 | 44 | 10 | 0.7558 | 0.99 |
| 18.25 | 288.26 | 47.90 | 0.51 | 0.70 | 292 | 55.5 | 4.3 | 0.7243 | 0.89 |
| 19.25 | 287.68 | 48.33 | 0.59 | 0.71 | | | | | |
| 20.25 | 286.41 | 48.79 | 0.68 | 0.73 | 278 | 56.5 | 3.8 | 0.7298 | 0.94 |
| | | | | 0.65 | | | | 0.6744 | 0.90 |
| | | | | | | | | | |
| | | | | | | | | | |
| Calibration Carbon Longterm Evolution End of Cycle | | | | | | | | | |
| Time (d) | Sim | | | Exp | | | | | |
| | S_NH | S_NO2 | S_NO3 | S_NH | S_NO2 | S_NO3 | | | |
| 0.75 | 193.31 | 0 | 0 | | | | | | |
| 1.75 | 295.56 | 0 | 0 | | | | | | |
| 2.75 | 307.54 | 0 | 0 | | | | | | |
| 3.75 | 295.51 | 0 | 0 | | | | | | |
| 4.75 | 276.47 | 0 | 0 | | 0.1 | 0.23 | | | |
| 5.75 | 255.71 | 0 | 0 | | | | | | |
| 6.75 | 234.6 | 0 | 0 | | | | | | |
| 7.75 | 213.53 | 0 | 0 | | | | | | |
| 8.75 | 192.56 | 0 | 0 | | | | | | |
| 9.75 | 171.66 | 0 | 0 | | | | | | |
| 10.75 | 150.81 | 0 | 0 | | 0.05 | 0.12 | | | |
| 11.75 | 129.95 | 0 | 0 | | | | | | |
| 12.75 | 109.05 | 0 | 0 | | | | | | |
| 13.75 | 88.094 | 0 | 0 | | | | | | |
| 14.75 | 67.087 | 0 | 0 | | | | | | |
| 15.75 | 46.113 | 0 | 0 | | | | | | |
| 16.75 | 26.501 | 0 | 0 | | 0.23 | 0.12 | | | |
| 17.75 | 25.522 | 0 | 0 | | | | | | |
| 18.75 | 25.575 | 0 | 0 | | | | | | |
| 19.75 | 23.061 | 0 | 0 | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

| Calibration Carbon Long term Evolution End of Nitrification | | | | | | | | | |
|---|-------|-------|-------|------|-------|-------|------|------|------|
| Time (d) | Sim | | | Exp | | | ARD | | |
| | S_NH | S_NO2 | S_NO3 | S_NH | S_NO2 | S_NO3 | | | |
| 0.25 | 190.7 | 29.9 | 2.0 | | | | | | |
| 1.25 | 289.8 | 68.3 | 1.3 | 264 | 72 | 19.5 | 0.10 | 0.05 | 0.94 |
| 2.25 | 301.5 | 71.0 | 1.4 | | | | | | |
| 3.25 | 287.8 | 86.5 | 2.4 | | | | | | |
| 4.25 | 267.4 | 98.8 | 3.3 | | | | | | |
| 5.25 | 245.2 | 111.6 | 4.2 | 241 | 115 | 8 | 0.02 | 0.03 | 0.47 |
| 6.25 | 222.6 | 124.2 | 5.1 | | | | | | |
| 7.25 | 200.2 | 136.7 | 5.9 | | | | | | |
| 8.25 | 177.8 | 149.1 | 6.7 | | | | | | |
| 9.25 | 155.6 | 161.5 | 7.3 | 143 | 178 | 9 | 0.09 | 0.09 | 0.19 |
| 10.25 | 133.4 | 174.0 | 7.8 | | | | | | |
| 11.25 | 111.1 | 186.4 | 8.2 | | | | | | |
| 12.25 | 88.9 | 198.8 | 8.5 | 118 | 202 | 5.8 | 0.25 | 0.02 | 0.47 |
| 13.25 | 66.6 | 211.1 | 8.8 | | | | | | |
| 14.25 | 44.3 | 223.2 | 9.2 | | | | | | |
| 15.25 | 22.0 | 235.0 | 9.7 | 57.5 | 251 | 4 | 0.62 | 0.06 | 1.43 |
| 16.25 | 1.4 | 244.8 | 11.1 | | | | | | |
| 17.25 | 0.0 | 234.1 | 16.4 | 39 | 242 | 12.3 | 1.00 | 0.03 | 0.33 |
| 18.25 | 0.0 | 229.9 | 21.1 | 8 | 238 | 27.5 | 1.00 | 0.03 | 0.23 |
| 19.25 | 0.0 | 226.2 | 26.7 | | | | | | |
| 20.25 | 0.0 | 221.8 | 35.5 | 2.6 | 245 | 16.3 | 0.99 | 0.09 | 1.18 |

| Calibration Carbon Long term Evolution End of Denitrification | | | | | | | | | |
|---|-------|-------|-------|------|-------|-------|------|------|------|
| Time (d) | Sim | | | Exp | | | ARD | | |
| | S_NH | S_NO2 | S_NO3 | S_NH | S_NO2 | S_NO3 | | | |
| 0.34 | 193.7 | 5.2 | 0 | | | | ARD | | |
| 1.34 | 297.5 | 19.3 | 0 | 261 | 37 | 10.1 | 0.14 | 0.48 | 1.00 |
| 2.34 | 309.3 | 17.9 | 0 | | | | | | |
| 3.34 | 297.9 | 23.3 | 0 | | | | | | |
| 4.34 | 279.3 | 26.7 | 0 | | | | | | |
| 5.34 | 258.9 | 30.3 | 0 | 230 | 48 | 3.2 | 0.13 | 0.37 | 1.00 |
| 6.34 | 238.1 | 33.5 | 0 | | | | | | |
| 7.34 | 217.4 | 36.4 | 0 | | | | | | |
| 8.34 | 196.7 | 39.2 | 0 | | | | | | |
| 9.34 | 176.1 | 41.7 | 0 | 144 | 32 | 1.5 | 0.22 | 0.30 | 1.00 |
| 10.34 | 155.4 | 44.1 | 0 | | | | | | |
| 11.34 | 134.8 | 46.4 | 0 | | | | | | |
| 12.34 | 114.1 | 48.5 | 0 | 122 | 42.59 | 0.5 | 0.06 | 0.14 | 1.00 |
| 13.34 | 93.3 | 50.4 | 0 | | | | | | |
| 14.34 | 72.4 | 51.9 | 0 | | | | | | |
| 15.34 | 51.5 | 53.0 | 0 | 64 | 51.2 | 1.6 | 0.19 | 0.04 | 1.00 |
| 16.34 | 31.8 | 52.4 | 0 | | | | | | |
| 17.34 | 9.8 | 38.6 | 0 | 40.5 | 32.1 | 0.6 | 0.76 | 0.20 | 1.00 |
| 18.34 | 9.6 | 29.2 | 0 | 7 | 52 | 3.1 | 0.37 | 0.44 | 1.00 |
| 19.34 | 9.1 | 19.8 | 0 | | | | | | |
| 20.34 | 8.6 | 11.8 | 0 | 8.5 | 37.2 | 2 | 0.02 | 0.68 | 1.00 |

| Calibration Carbon Long term Evolution Carbon addition | | | | | |
|--|----------|----------|----------|--|--|
| | Sim | Exp | | | |
| Time (d) | C(S_S) | C(S_S) | opt | | |
| 1.26 | 203.44 | | | | |
| 2.26 | 207.6196 | 438 | | | |
| 3.26 | 266.7124 | | | | |
| 4.26 | 312.2113 | | | | |
| 5.26 | 359.3049 | | | | |
| 6.26 | 404.0101 | 521 | | | |
| 7.26 | 447.3295 | | | | |
| 8.26 | 489.0628 | | | | |
| 9.26 | 529.37 | | | | |
| 10.26 | 568.3441 | 1045 | | | |
| 11.26 | 606.1108 | | | | |
| 12.26 | 642.7974 | | | | |
| 13.26 | 678.5423 | 646 | | | |
| 14.26 | 713.5096 | | | | |
| 15.26 | 747.9253 | | | | |
| 16.26 | 781.5374 | 1128 | | | |
| 17.26 | 771.7244 | | | | |
| 18.26 | 773.3868 | 1347 | | | |
| 19.26 | 783.0166 | | | | |
| 20.26 | 812.0445 | 897 | | | |
| | | saving C | | | |
| | | | | | |
| | | 780.1242 | 845 | | |
| | | sim | exp | | |
| | | 0.960691 | 0.942029 | | |
| | | 3.930854 | 5.797101 | | |

| Calibration Carbon Cycle Evolution Nutrient | | | | | | | | | | |
|---|----------|-------|-------|-------|------|-------|-------|--------|-------|--------|
| | | Sim | | | Exp | | | ARD | | |
| Time (h) | Time (d) | S_NH | S_NO2 | S_NO3 | S_NH | S_NO2 | S_NO3 | S_NH | S_NO2 | S_NO3 |
| 0 | 20 | 286.4 | 48.8 | 0.7 | 278 | 56.5 | 3.8 | 0.03 | 0.14 | 0.82 |
| 0.24 | 20.01 | 271.6 | 56.6 | 1.5 | | | | | | |
| 0.48 | 20.02 | 256.8 | 64.6 | 2.4 | | | | | | |
| 0.72 | 20.03 | 242.0 | 72.9 | 3.3 | | | | | | |
| 0.96 | 20.04 | 227.2 | 81.5 | 4.2 | | | | | | |
| 1.2 | 20.05 | 212.3 | 90.4 | 5.1 | | | | | | |
| 1.44 | 20.06 | 197.4 | 99.5 | 6.0 | | | | | | |
| 1.68 | 20.07 | 182.4 | 108.8 | 6.9 | | | | | | |
| 1.92 | 20.08 | 167.5 | 118.4 | 7.8 | 164 | 130 | 16.8 | 0.0212 | 0.089 | 0.5356 |
| 2.16 | 20.09 | 152.5 | 128.2 | 8.7 | | | | | | |
| 2.4 | 20.1 | 137.5 | 138.2 | 9.7 | | | | | | |
| 2.64 | 20.11 | 122.4 | 148.5 | 10.6 | | | | | | |
| 2.88 | 20.12 | 107.4 | 158.9 | 11.5 | | | | | | |
| 3.12 | 20.13 | 92.3 | 169.5 | 12.5 | | | | | | |
| 3.36 | 20.14 | 77.2 | 180.3 | 13.4 | | | | | | |
| 3.6 | 20.15 | 62.1 | 191.3 | 14.4 | | | | | | |
| 3.84 | 20.16 | 47.0 | 202.4 | 15.4 | 75 | 182 | 15.5 | 0.3733 | 0.112 | 0.0068 |
| 4.08 | 20.17 | 32.0 | 213.7 | 16.4 | | | | | | |
| 4.32 | 20.18 | 17.1 | 224.9 | 17.5 | | | | | | |
| 4.56 | 20.19 | 3.0 | 235.6 | 18.8 | | | | | | |
| 4.8 | 20.2 | 0.0 | 235.3 | 21.8 | | | | | | |
| 5.04 | 20.21 | 0.0 | 231.9 | 25.2 | | | | | | |
| 5.28 | 20.22 | 0.0 | 228.5 | 28.7 | | | | | | |
| 5.52 | 20.23 | 0.0 | 225.1 | 32.1 | | | | | | |
| 5.76 | 20.24 | 0.0 | 221.8 | 35.5 | 3.75 | 245 | 16.3 | 0.9944 | 0.095 | 1.1788 |
| 6 | 20.25 | 0.0 | 217.7 | 36.6 | | | | | | |
| 6.24 | 20.26 | 6.3 | 186.9 | 22.6 | | | | | | |
| 6.48 | 20.27 | 12.5 | 152.6 | 8.0 | | | | | | |
| 6.72 | 20.28 | 16.9 | 116.0 | 0.5 | | | | | | |
| 6.96 | 20.29 | 19.0 | 77.4 | 0.5 | 7 | 74 | 5.7 | 1.7206 | 0.047 | 0.9126 |
| 7.2 | 20.3 | 19.2 | 49.0 | 0.4 | | | | | | |
| 7.44 | 20.31 | 17.7 | 33.4 | 0.3 | | | | | | |
| 7.68 | 20.32 | 11.3 | 18.5 | 0.2 | | | | | | |
| 7.92 | 20.33 | 10.6 | 11.8 | 0.2 | 8.5 | 37.2 | 2 | 0.2489 | 0.683 | 0.8825 |
| 8.16 | 20.34 | 10.3 | 8.9 | 0.2 | | | | | | |
| 8.4 | 20.35 | 10.1 | 6.1 | 0.2 | | | | | | |
| 8.64 | 20.36 | 9.8 | 3.4 | 0.2 | | | | | | |
| 8.88 | 20.37 | 9.6 | 1.0 | 0.2 | | | | | | |
| 9.12 | 20.38 | 9.5 | 0.1 | 0.2 | | | | | | |
| 9.36 | 20.39 | 9.4 | 0 | 0 | | | | | | |
| 9.6 | 20.4 | 9.4 | 0 | 0 | | | | | | |
| 9.84 | 20.41 | 9.4 | 0 | 0 | | | | | | |
| 10.08 | 20.42 | 9.4 | 0 | 0 | | | | | | |
| 10.32 | 20.43 | 9.4 | 0 | 0 | | | | | | |
| 10.56 | 20.44 | 9.4 | 0 | 0 | | | | | | |
| 10.8 | 20.45 | 9.4 | 0 | 0 | | | | | | |
| 11.04 | 20.46 | 9.4 | 0 | 0 | | | | | | |
| 11.28 | 20.47 | 9.4 | 0 | 0 | | | | | | |
| 11.52 | 20.48 | 9.4 | 0 | 0 | | | | | | |
| 11.76 | 20.49 | 9.4 | 0 | 0 | 8 | 0.1 | 0.3 | 0.1735 | 1 | 1 |
| 12 | 20.5 | 9.4 | 0 | 0 | | | | | | |

| Time (h) | Time (d) | Sim | | | Exp | | | ARD | | |
|----------|----------|------|-------|-------|------|-------|-------|------|-------|-------|
| | | S_NH | S_NO2 | S_NO3 | S_NH | S_NO2 | S_NO3 | S_NH | S_NO2 | S_NO3 |
| 13.44 | 20.56 | 9.4 | 0 | 0 | | | | | | |
| 13.68 | 20.57 | 9.4 | 0 | 0 | | | | | | |
| 13.92 | 20.58 | 9.4 | 0 | 0 | | | | | | |
| 14.16 | 20.59 | 9.4 | 0 | 0 | | | | | | |
| 14.4 | 20.6 | 9.4 | 0 | 0 | | | | | | |
| 14.64 | 20.61 | 9.4 | 0 | 0 | | | | | | |
| 14.88 | 20.62 | 9.4 | 0 | 0 | | | | | | |
| 15.12 | 20.63 | 9.4 | 0 | 0 | | | | | | |
| 15.36 | 20.64 | 9.4 | 0 | 0 | | | | | | |
| 15.6 | 20.65 | 9.4 | 0 | 0 | | | | | | |
| 15.84 | 20.66 | 9.4 | 0 | 0 | | | | | | |
| 16.08 | 20.67 | 9.4 | 0 | 0 | | | | | | |
| 16.32 | 20.68 | 9.4 | 0 | 0 | | | | | | |
| 16.56 | 20.69 | 9.4 | 0 | 0 | | | | | | |
| 16.8 | 20.7 | 9.4 | 0 | 0 | | | | | | |
| 17.04 | 20.71 | 9.4 | 0 | 0 | | | | | | |
| 17.28 | 20.72 | 9.4 | 0 | 0 | | | | | | |
| 17.52 | 20.73 | 9.4 | 0 | 0 | | | | | | |
| 17.76 | 20.74 | 9.4 | 0 | 0 | | | | | | |
| 18 | 20.75 | 9.4 | 0 | 0 | | | | | | |
| 18.24 | 20.76 | 9.4 | 0 | 0 | | | | | | |
| 18.48 | 20.77 | 9.4 | 0 | 0 | | | | | | |
| 18.72 | 20.78 | 9.4 | 0 | 0 | | | | | | |
| 18.96 | 20.79 | 9.4 | 0 | 0 | | | | | | |
| 19.2 | 20.8 | 9.4 | 0 | 0 | | | | | | |
| 19.44 | 20.81 | 9.4 | 0 | 0 | | | | | | |
| 19.68 | 20.82 | 9.4 | 0 | 0 | | | | | | |
| 19.92 | 20.83 | 9.4 | 0 | 0 | | | | | | |
| 20.16 | 20.84 | 9.4 | 0 | 0 | | | | | | |
| 20.4 | 20.85 | 9.4 | 0 | 0 | | | | | | |
| 20.64 | 20.86 | 9.4 | 0 | 0 | | | | | | |
| 20.88 | 20.87 | 9.4 | 0 | 0 | | | | | | |
| 21.12 | 20.88 | 9.4 | 0 | 0 | | | | | | |
| 21.36 | 20.89 | 9.4 | 0 | 0 | | | | | | |
| 21.6 | 20.9 | 9.4 | 0 | 0 | | | | | | |
| 21.84 | 20.91 | 9.4 | 0 | 0 | | | | | | |
| 22.08 | 20.92 | 9.4 | 0 | 0 | | | | | | |
| 22.32 | 20.93 | 9.4 | 0 | 0 | | | | | | |
| 22.56 | 20.94 | 9.4 | 0 | 0 | | | | | | |
| 22.8 | 20.95 | 9.4 | 0 | 0 | | | | | | |
| 23.04 | 20.96 | 9.4 | 0 | 0 | | | | | | |
| 23.28 | 20.97 | 9.4 | 0 | 0 | | | | | | |
| 23.52 | 20.98 | 9.4 | 0 | 0 | | | | | | |
| 23.76 | 20.99 | 9.4 | 0 | 0 | | | | | | |
| 24 | 21 | 9.4 | 0 | 0 | | | | | | |

| Optimisation Carbon Cycle Evolution Nutrient | | | | | | | | | |
|--|------------------|-------|-------|------------------|-------|-------|----------|--------|-------|
| Time (h) | Optimisation_Sim | | | Optimisation_Exp | | | ARD | | |
| | S_NH | S_NO2 | S_NO3 | S_NH | S_NO2 | S_NO3 | S_NH | S_NO2 | S_NO3 |
| 0 | 287.8 | 50.9 | 1.1 | 256 | 45.8 | 19.5 | 0.124282 | 0.1105 | 0.944 |
| 0.24 | 272.9 | 59.4 | 1.9 | | | | | | |
| 0.48 | 258.0 | 68.2 | 2.7 | | | | | | |
| 0.72 | 243.1 | 77.2 | 3.4 | | | | | | |
| 0.96 | 228.1 | 86.4 | 4.2 | | | | | | |
| 1.2 | 213.1 | 95.9 | 5.0 | | | | | | |
| 1.44 | 198.1 | 105.5 | 5.7 | | | | | | |
| 1.68 | 183.0 | 115.4 | 6.5 | | | | | | |
| 1.92 | 167.9 | 125.4 | 7.3 | 152.5 | 109 | 12.2 | 0.101159 | 0.1505 | 0.402 |
| 2.16 | 152.8 | 135.6 | 8.1 | | | | | | |
| 2.4 | 137.7 | 146.1 | 8.9 | | | | | | |
| 2.64 | 122.5 | 156.6 | 9.6 | | | | | | |
| 2.88 | 107.3 | 167.4 | 10.4 | 98 | 156 | 17.8 | 0.094852 | 0.0731 | 0.414 |
| 3.12 | 92.1 | 178.3 | 11.2 | | | | | | |
| 3.36 | 76.9 | 189.4 | 12.0 | | | | | | |
| 3.6 | 61.6 | 200.6 | 12.8 | | | | | | |
| 3.84 | 46.4 | 211.9 | 13.7 | | | | | | |
| 4.08 | 31.3 | 223.4 | 14.5 | | | | | | |
| 4.32 | 16.2 | 234.9 | 15.5 | | | | | | |
| 4.56 | 2.3 | 246.6 | 16.7 | | | | | | |
| 4.8 | 0.0 | 255.9 | 19.6 | 9 | 237 | 22.2 | 0.997815 | 0.0795 | 0.119 |
| 5.04 | 0.4 | 250.9 | 19.0 | | | | | | |
| 5.28 | 3.7 | 235.1 | 10.7 | | | | | | |
| 5.52 | 6.7 | 218.3 | 2.4 | | | | | | |
| 5.76 | 10.7 | 199.9 | 0.0 | 8.5 | 125.1 | 3.8 | 0.26006 | 0.5982 | 1.119 |
| 6 | 5.0 | 180.0 | 0.0 | | | | | | |
| 6.24 | 8.9 | 158.7 | 0.5 | | | | | | |
| 6.48 | 12.5 | 136.3 | 0.5 | | | | | | |
| 6.72 | 14.8 | 112.7 | 0.5 | | | | | | |
| 6.96 | 14.4 | 90.6 | 0.4 | 7.75 | 55.5 | 0.4 | 0.861561 | 0.6321 | 0.007 |
| 7.2 | 13.0 | 77.1 | 0.3 | | | | | | |
| 7.44 | 11.7 | 64.2 | 0.3 | | | | | | |
| 7.68 | 10.4 | 51.8 | 0.3 | | | | | | |
| 7.92 | 9.8 | 46.1 | 0.2 | 5.5 | 32.18 | 0.3 | 0.788921 | 0.4326 | 0.181 |
| 8.16 | 9.6 | 43.6 | 0.2 | | | | | | |
| 8.4 | 9.4 | 41.1 | 0.2 | | | | | | |
| 8.64 | 9.1 | 38.7 | 0.2 | | | | | | |
| 8.88 | 8.9 | 36.3 | 0.2 | | | | | | |
| 9.12 | 8.6 | 33.9 | 0.2 | | | | | | |
| 9.36 | 8.4 | 31.5 | 0.2 | | | | | | |
| 9.6 | 8.2 | 29.1 | 0.2 | | | | | | |
| 9.84 | 8.0 | 26.8 | 0.2 | | | | | | |
| 10.08 | 7.8 | 24.5 | 0.2 | | | | | | |
| 10.32 | 7.6 | 22.2 | 0.2 | | | | | | |
| 10.56 | 7.3 | 20.0 | 0.2 | | | | | | |
| 10.8 | 7.1 | 17.7 | 0.2 | | | | | | |
| 11.04 | 7.0 | 15.5 | 0.2 | | | | | | |
| 11.28 | 6.8 | 13.3 | 0.2 | | | | | | |
| 11.52 | 6.6 | 11.2 | 0.2 | | | | | | |
| 11.76 | 6.5 | 9.1 | 0.2 | | | | | | |
| 12 | 6.5 | 7.0 | 0.1 | | | | | | |
| 12.24 | 6.4 | 5.0 | 0.0 | | | | | | |

| Time (h) | Optimisation_Sim | | | Optimisation_Exp | | | ARD | | |
|----------|------------------|-------|-------|------------------|-------|-------|----------|--------|-------|
| | S_NH | S_NO2 | S_NO3 | S_NH | S_NO2 | S_NO3 | S_NH | S_NO2 | S_NO3 |
| 13.44 | 6.4 | 0 | 0 | | | | | | |
| 13.68 | 6.4 | 0 | 0 | | | | | | |
| 13.92 | 6.4 | 0 | 0 | | | | | | |
| 14.16 | 6.4 | 0 | 0 | | | | | | |
| 14.4 | 6.4 | 0 | 0 | | | | | | |
| 14.64 | 6.4 | 0 | 0 | | | | | | |
| 14.88 | 6.4 | 0 | 0 | | | | | | |
| 15.12 | 6.4 | 0 | 0 | | | | | | |
| 15.36 | 6.4 | 0 | 0 | | | | | | |
| 15.6 | 6.4 | 0 | 0 | | | | | | |
| 15.84 | 6.4 | 0 | 0 | | | | | | |
| 16.08 | 6.4 | 0 | 0 | | | | | | |
| 16.32 | 6.4 | 0 | 0 | | | | | | |
| 16.56 | 6.4 | 0 | 0 | | | | | | |
| 16.8 | 6.4 | 0 | 0 | | | | | | |
| 17.04 | 6.4 | 0 | 0 | | | | | | |
| 17.28 | 6.4 | 0 | 0 | | | | | | |
| 17.52 | 6.4 | 0 | 0 | | | | | | |
| 17.76 | 6.4 | 0 | 0 | | | | | | |
| 18 | 6.4 | 0 | 0 | | | | | | |
| 18.24 | 6.4 | 0 | 0 | | | | | | |
| 18.48 | 6.4 | 0 | 0 | | | | | | |
| 18.72 | 6.4 | 0 | 0 | | | | | | |
| 18.96 | 6.4 | 0 | 0 | | | | | | |
| 19.2 | 6.4 | 0 | 0 | | | | | | |
| 19.44 | 6.4 | 0 | 0 | | | | | | |
| 19.68 | 6.4 | 0 | 0 | | | | | | |
| 19.92 | 6.4 | 0 | 0 | | | | | | |
| 20.16 | 6.4 | 0 | 0 | | | | | | |
| 20.4 | 6.4 | 0 | 0 | | | | | | |
| 20.64 | 6.4 | 0 | 0 | | | | | | |
| 20.88 | 6.4 | 0 | 0 | | | | | | |
| 21.12 | 6.4 | 0 | 0 | | | | | | |
| 21.36 | 6.4 | 0 | 0 | | | | | | |
| 21.6 | 6.4 | 0 | 0 | | | | | | |
| 21.84 | 6.4 | 0 | 0 | | | | | | |
| 22.08 | 6.4 | 0 | 0 | | | | | | |
| 22.32 | 6.4 | 0 | 0 | | | | | | |
| 22.56 | 6.4 | 0 | 0 | | | | | | |
| 22.8 | 6.4 | 0 | 0 | | | | | | |
| 23.04 | 6.4 | 0 | 0 | | | | | | |
| 23.28 | 6.4 | 0 | 0 | | | | | | |
| 23.52 | 6.4 | 0 | 0 | | | | | | |
| 23.76 | 6.4 | 0 | 0 | 5 | 0.1 | 0.2 | 0.287939 | 0.9999 | 1 |
| 24 | | | | | | | 0.439574 | 0.3846 | 0.523 |

| Calibration Carbon Cycle Evolution Oxygen | | | | | | | | | | | |
|---|-----------|----------|-----------|----------|-----------|----------|-----------|----------|-----------|----------|-----------|
| Exp | | | | | | | | | | | |
| Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) |
| 0 | 7.84 | 1.917 | 0.36 | 3.842 | 0.37 | 5.767 | 0.38 | 7.692 | 0.03 | 9.725 | 0.03 |
| 0.033 | 2.79 | 1.958 | 0.43 | 3.883 | 0.37 | 5.808 | 0.38 | 7.733 | 0.03 | 9.758 | 0.02 |
| 0.067 | 1.51 | 1.992 | 0.43 | 3.917 | 0.33 | 5.842 | 0.45 | 7.767 | 0.03 | 9.792 | 0.03 |
| 0.1 | 0.72 | 2.025 | 0.42 | 3.95 | 0.34 | 5.875 | 0.38 | 7.8 | 0.03 | 9.833 | 0.03 |
| 0.133 | 0.66 | 2.058 | 0.44 | 3.983 | 0.35 | 5.908 | 0.42 | 7.833 | 0.03 | 9.867 | 0.03 |
| 0.167 | 0.63 | 2.092 | 0.33 | 4.017 | 0.35 | 5.942 | 0.44 | 7.867 | 0.03 | 9.9 | 0.03 |
| 0.208 | 0.63 | 2.133 | 0.34 | 4.058 | 0.37 | 5.983 | 0.09 | 7.908 | 0.02 | 9.933 | 0.03 |
| 0.242 | 0.59 | 2.167 | 0.31 | 4.092 | 0.34 | 6.017 | 0.11 | 7.942 | 0.03 | 9.967 | 0.03 |
| 0.275 | 0.62 | 2.2 | 0.36 | 4.125 | 0.37 | 6.05 | 0.1 | 7.975 | 0.02 | 10.01 | 0.03 |
| 0.308 | 0.59 | 2.233 | 0.34 | 4.158 | 0.37 | 6.083 | 0.03 | 8.008 | 0.03 | 10.04 | 0.03 |
| 0.342 | 0.58 | 2.267 | 0.34 | 4.192 | 0.36 | 6.117 | 0.02 | 8.042 | 0.03 | 10.08 | 0.03 |
| 0.383 | 0.58 | 2.308 | 0.34 | 4.233 | 0.35 | 6.158 | 0.03 | 8.083 | 0.03 | 10.11 | 0.03 |
| 0.417 | 0.55 | 2.342 | 0.35 | 4.267 | 0.37 | 6.192 | 0.02 | 8.117 | 0.03 | 10.14 | 0.03 |
| 0.45 | 0.56 | 2.375 | 0.41 | 4.3 | 0.36 | 6.225 | 0.03 | 8.15 | 0.03 | 10.18 | 0.03 |
| 0.483 | 0.55 | 2.408 | 0.35 | 4.333 | 0.35 | 6.258 | 0.03 | 8.183 | 0.03 | 10.22 | 0.03 |
| 0.517 | 0.56 | 2.442 | 0.34 | 4.367 | 0.35 | 6.292 | 0.03 | 8.217 | 0.03 | 10.25 | 0.03 |
| 0.558 | 0.51 | 2.483 | 0.34 | 4.408 | 0.34 | 6.333 | 0.03 | 8.258 | 0.03 | 10.28 | 0.02 |
| 0.592 | 0.5 | 2.517 | 0.36 | 4.442 | 0.37 | 6.367 | 0.03 | 8.292 | 0.03 | 10.32 | 0.02 |
| 0.625 | 0.52 | 2.55 | 0.33 | 4.475 | 0.36 | 6.4 | 0.03 | 8.325 | 0.03 | 10.36 | 0.02 |
| 0.658 | 0.52 | 2.583 | 0.35 | 4.508 | 0.36 | 6.433 | 0.03 | 8.358 | 0.03 | 10.39 | 0.03 |
| 0.692 | 0.52 | 2.617 | 0.35 | 4.542 | 0.36 | 6.467 | 0.03 | 8.392 | 0.03 | 10.43 | 0.03 |
| 0.733 | 0.49 | 2.658 | 0.35 | 4.583 | 0.37 | 6.508 | 0.03 | 8.433 | 0.03 | 10.46 | 0.03 |
| 0.767 | 0.5 | 2.692 | 0.34 | 4.617 | 0.37 | 6.542 | 0.03 | 8.467 | 0.03 | 10.49 | 0.04 |
| 0.8 | 0.49 | 2.725 | 0.35 | 4.65 | 0.41 | 6.575 | 0.03 | 8.5 | 0.02 | 10.53 | 0.03 |
| 0.833 | 0.5 | 2.758 | 0.38 | 4.683 | 0.37 | 6.608 | 0.03 | 8.533 | 0.02 | 10.57 | 0.03 |
| 0.867 | 0.48 | 2.792 | 0.31 | 4.717 | 0.36 | 6.642 | 0.02 | 8.567 | 0.02 | 10.6 | 0.03 |
| 0.908 | 0.48 | 2.833 | 0.34 | 4.758 | 0.36 | 6.683 | 0.03 | 8.608 | 0.03 | 10.63 | 0.03 |
| 0.942 | 0.47 | 2.867 | 0.35 | 4.792 | 0.39 | 6.717 | 0.02 | 8.642 | 0.03 | 10.67 | 0.03 |
| 0.975 | 0.49 | 2.9 | 0.35 | 4.825 | 0.38 | 6.75 | 0.02 | 8.675 | 0.03 | 10.71 | 0.03 |
| 1.008 | 0.48 | 2.933 | 0.47 | 4.858 | 0.39 | 6.783 | 0.02 | 8.708 | 0.04 | 10.74 | 0.03 |
| 1.042 | 0.47 | 2.967 | 0.42 | 4.892 | 0.37 | 6.817 | 0.03 | 8.742 | 0.03 | 10.78 | 0.03 |
| 1.083 | 0.39 | 3.008 | 0.45 | 4.933 | 0.39 | 6.858 | 0.03 | 8.783 | 0.03 | 10.81 | 0.02 |
| 1.117 | 0.38 | 3.042 | 0.43 | 4.967 | 0.38 | 6.892 | 0.03 | 8.817 | 0.03 | 10.84 | 0.03 |
| 1.15 | 0.38 | 3.075 | 0.42 | 5 | 0.42 | 6.925 | 0.04 | 8.85 | 0.03 | 10.88 | 0.02 |
| 1.183 | 0.38 | 3.108 | 0.39 | 5.033 | 0.36 | 6.958 | 0.03 | 8.883 | 0.03 | 10.92 | 0.02 |
| 1.217 | 0.39 | 3.142 | 0.38 | 5.067 | 0.37 | 6.992 | 0.03 | 8.917 | 0.03 | 10.95 | 0.02 |
| 1.258 | 0.37 | 3.183 | 0.37 | 5.108 | 0.35 | 7.033 | 0.03 | 8.958 | 0.03 | 10.98 | 0.03 |
| 1.292 | 0.38 | 3.217 | 0.38 | 5.142 | 0.39 | 7.067 | 0.03 | 8.992 | 0.03 | 11.02 | 0.03 |
| 1.325 | 0.38 | 3.25 | 0.36 | 5.175 | 0.37 | 7.1 | 0.03 | 9.025 | 0.02 | 11.06 | 0.03 |
| 1.358 | 0.42 | 3.283 | 0.38 | 5.208 | 0.38 | 7.133 | 0.03 | 9.058 | 0.03 | 11.09 | 0.04 |
| 1.392 | 0.38 | 3.317 | 0.36 | 5.242 | 0.37 | 7.167 | 0.03 | 9.092 | 0.02 | 11.13 | 0.03 |
| 1.433 | 0.38 | 3.358 | 0.37 | 5.283 | 0.35 | 7.208 | 0.03 | 9.133 | 0.02 | 11.16 | 0.03 |
| 1.467 | 0.37 | 3.392 | 0.37 | 5.317 | 0.37 | 7.242 | 0.02 | 9.167 | 0.02 | 11.19 | 0.03 |
| 1.5 | 0.38 | 3.425 | 0.37 | 5.35 | 0.38 | 7.275 | 0.03 | 9.2 | 0.03 | 11.23 | 0.03 |
| 1.533 | 0.35 | 3.458 | 0.36 | 5.383 | 0.38 | 7.308 | 0.02 | 9.233 | 0.03 | 11.27 | 0.03 |
| 1.567 | 0.4 | 3.492 | 0.33 | 5.417 | 0.37 | 7.342 | 0.02 | 9.267 | 0.03 | 11.3 | 0.03 |
| 1.608 | 0.37 | 3.533 | 0.35 | 5.458 | 0.36 | 7.383 | 0.02 | 9.308 | 0.04 | 11.33 | 0.03 |
| 1.642 | 0.37 | 3.567 | 0.36 | 5.492 | 0.36 | 7.417 | 0.03 | 9.342 | 0.03 | 11.37 | 0.03 |
| 1.675 | 0.33 | 3.6 | 0.43 | 5.525 | 0.36 | 7.45 | 0.03 | 9.375 | 0.03 | 11.41 | 0.02 |
| 1.708 | 0.35 | 3.633 | 0.35 | 5.558 | 0.36 | 7.483 | 0.03 | 9.408 | 0.03 | 11.44 | 0.02 |
| 1.742 | 0.37 | 3.667 | 0.32 | 5.592 | 0.36 | 7.517 | 0.03 | 9.442 | 0.03 | 11.48 | 0.02 |
| 1.783 | 0.36 | 3.708 | 0.37 | 5.633 | 0.35 | 7.558 | 0.03 | 9.483 | 0.03 | 11.51 | 0.03 |

| Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) |
|----------|-----------|----------|-----------|----------|-----------|----------|-----------|----------|-----------|----------|-----------|
| 11.76 | 0.03 | 1.775 | 0.51 | 3.808 | 0.4 | 5.833 | 0.05 | 7.867 | 0.02 | 9.9 | 0.02 |
| 11.79 | 0.03 | 1.808 | 0.44 | 3.842 | 0.42 | 5.875 | 0.05 | 7.9 | 0.02 | 9.933 | 0.02 |
| 11.83 | 0.03 | 1.85 | 0.46 | 3.875 | 0.4 | 5.908 | 0.05 | 7.933 | 0.05 | 9.967 | 0.02 |
| 11.86 | 0.03 | 1.883 | 0.43 | 3.908 | 0.39 | 5.942 | 0.05 | 7.975 | 0.05 | 10 | 0.06 |
| 11.89 | 0.03 | 1.917 | 0.43 | 3.95 | 0.43 | 5.975 | 0.05 | 8.008 | 0.04 | 10.03 | 0.05 |
| 11.93 | 0.03 | 1.95 | 0.43 | 3.983 | 0.4 | 6.008 | 0.15 | 8.042 | 0.04 | 10.08 | 0.05 |
| 11.97 | 0.03 | 1.983 | 0.55 | 4.017 | 0.39 | 6.05 | 0.12 | 8.075 | 0.04 | 10.11 | 0.04 |
| 12 | 0.03 | 2.025 | 0.51 | 4.05 | 0.41 | 6.083 | 0.11 | 8.108 | 0.03 | 10.14 | 0.04 |
| 0.025 | 6.22 | 2.058 | 0.52 | 4.083 | 0.42 | 6.117 | 0.09 | 8.15 | 0.03 | 10.18 | 0.03 |
| 0.058 | 6.92 | 2.092 | 0.49 | 4.125 | 0.42 | 6.15 | 0.08 | 8.183 | 0.03 | 10.21 | 0.03 |
| 0.1 | 3.93 | 2.125 | 0.55 | 4.158 | 0.41 | 6.183 | 0.07 | 8.217 | 0.02 | 10.25 | 0.03 |
| 0.133 | 1.52 | 2.158 | 0.49 | 4.192 | 0.39 | 6.225 | 0.06 | 8.25 | 0.02 | 10.28 | 0.03 |
| 0.167 | 3.28 | 2.2 | 0.46 | 4.225 | 0.4 | 6.258 | 0.06 | 8.283 | 0.02 | 10.32 | 0.02 |
| 0.2 | 6.81 | 2.233 | 0.44 | 4.258 | 0.39 | 6.292 | 0.05 | 8.325 | 0.02 | 10.35 | 0.02 |
| 0.233 | 6.49 | 2.267 | 0.43 | 4.3 | 0.41 | 6.325 | 0.05 | 8.358 | 0.05 | 10.38 | 0.02 |
| 0.275 | 5.24 | 2.3 | 0.42 | 4.333 | 0.41 | 6.358 | 0.04 | 8.392 | 0.05 | 10.43 | 0.06 |
| 0.308 | 6.35 | 2.333 | 0.43 | 4.367 | 0.39 | 6.4 | 0.04 | 8.425 | 0.04 | 10.46 | 0.05 |
| 0.342 | 0.76 | 2.375 | 0.4 | 4.4 | 0.4 | 6.433 | 0.03 | 8.458 | 0.04 | 10.49 | 0.05 |
| 0.375 | 0.71 | 2.408 | 0.41 | 4.433 | 0.43 | 6.467 | 0.03 | 8.5 | 0.03 | 10.53 | 0.04 |
| 0.408 | 0.72 | 2.442 | 0.41 | 4.475 | 0.4 | 6.5 | 0.03 | 8.533 | 0.03 | 10.56 | 0.04 |
| 0.45 | 0.7 | 2.475 | 0.38 | 4.508 | 0.43 | 6.533 | 0.03 | 8.567 | 0.03 | 10.6 | 0.03 |
| 0.483 | 0.65 | 2.508 | 0.43 | 4.542 | 0.46 | 6.575 | 0.02 | 8.6 | 0.03 | 10.63 | 0.03 |
| 0.517 | 0.63 | 2.55 | 0.42 | 4.575 | 0.4 | 6.608 | 0.02 | 8.633 | 0.02 | 10.67 | 0.03 |
| 0.55 | 0.63 | 2.583 | 0.41 | 4.608 | 0.45 | 6.642 | 0.02 | 8.675 | 0.02 | 10.7 | 0.03 |
| 0.583 | 0.61 | 2.617 | 0.4 | 4.65 | 0.4 | 6.675 | 0.06 | 8.708 | 0.02 | 10.73 | 0.02 |
| 0.625 | 0.59 | 2.65 | 0.38 | 4.683 | 0.42 | 6.708 | 0.05 | 8.742 | 0.02 | 10.78 | 0.02 |
| 0.658 | 0.6 | 2.683 | 0.43 | 4.717 | 0.41 | 6.75 | 0.05 | 8.775 | 0.05 | 10.81 | 0.02 |
| 0.692 | 0.59 | 2.725 | 0.4 | 4.75 | 0.4 | 6.783 | 0.04 | 8.808 | 0.05 | 10.84 | 0.06 |
| 0.725 | 0.57 | 2.758 | 0.43 | 4.783 | 0.43 | 6.817 | 0.04 | 8.85 | 0.04 | 10.88 | 0.05 |
| 0.758 | 0.54 | 2.792 | 0.42 | 4.825 | 0.47 | 6.85 | 0.03 | 8.883 | 0.03 | 10.91 | 0.05 |
| 0.8 | 0.54 | 2.825 | 0.43 | 4.858 | 0.43 | 6.883 | 0.03 | 8.917 | 0.03 | 10.95 | 0.04 |
| 0.833 | 0.59 | 2.858 | 0.4 | 4.892 | 0.44 | 6.925 | 0.03 | 8.95 | 0.03 | 10.98 | 0.04 |
| 0.867 | 0.58 | 2.9 | 0.4 | 4.925 | 0.43 | 6.958 | 0.02 | 8.983 | 0.03 | 11.02 | 0.03 |
| 0.9 | 0.56 | 2.933 | 0.4 | 4.958 | 0.45 | 6.992 | 0.02 | 9.025 | 0.02 | 11.05 | 0.03 |
| 0.933 | 0.63 | 2.967 | 0.39 | 5 | 0.46 | 7.025 | 0.02 | 9.058 | 0.02 | 11.08 | 0.03 |
| 0.975 | 0.56 | 3 | 0.4 | 5.033 | 0.49 | 7.058 | 0.02 | 9.092 | 0.02 | 11.13 | 0.02 |
| 1.008 | 0.57 | 3.033 | 0.4 | 5.067 | 0.46 | 7.1 | 0.05 | 9.125 | 0.02 | 11.16 | 0.02 |
| 1.042 | 0.6 | 3.075 | 0.39 | 5.1 | 0.5 | 7.133 | 0.05 | 9.158 | 0.02 | 11.19 | 0.02 |
| 1.075 | 0.58 | 3.108 | 0.39 | 5.133 | 0.49 | 7.167 | 0.05 | 9.2 | 0.05 | 11.23 | 0.02 |
| 1.108 | 0.57 | 3.142 | 0.4 | 5.175 | 0.42 | 7.2 | 0.04 | 9.233 | 0.05 | 11.26 | 0.06 |
| 1.15 | 0.51 | 3.175 | 0.39 | 5.208 | 0.44 | 7.233 | 0.04 | 9.267 | 0.04 | 11.3 | 0.05 |
| 1.183 | 0.52 | 3.208 | 0.39 | 5.242 | 0.43 | 7.275 | 0.03 | 9.3 | 0.03 | 11.33 | 0.05 |
| 1.217 | 0.48 | 3.25 | 0.4 | 5.275 | 0.45 | 7.308 | 0.03 | 9.333 | 0.03 | 11.37 | 0.04 |
| 1.25 | 0.47 | 3.283 | 0.38 | 5.308 | 0.47 | 7.342 | 0.03 | 9.375 | 0.03 | 11.4 | 0.04 |
| 1.283 | 0.47 | 3.317 | 0.43 | 5.35 | 0.48 | 7.375 | 0.02 | 9.408 | 0.03 | 11.43 | 0.03 |
| 1.325 | 0.47 | 3.35 | 0.39 | 5.383 | 0.54 | 7.408 | 0.02 | 9.442 | 0.02 | 11.48 | 0.03 |
| 1.358 | 0.45 | 3.383 | 0.39 | 5.417 | 0.55 | 7.45 | 0.02 | 9.475 | 0.02 | 11.51 | 0.03 |
| 1.392 | 0.49 | 3.425 | 0.4 | 5.45 | 0.75 | 7.483 | 0.02 | 9.508 | 0.02 | 11.54 | 0.02 |
| 1.425 | 0.47 | 3.458 | 0.42 | 5.483 | 0.87 | 7.517 | 0.05 | 9.55 | 0.02 | 11.58 | 0.02 |
| 1.458 | 0.46 | 3.492 | 0.37 | 5.525 | 1.51 | 7.55 | 0.05 | 9.583 | 0.06 | 11.61 | 0.02 |
| 1.5 | 0.44 | 3.525 | 0.47 | 5.558 | 2.36 | 7.583 | 0.05 | 9.617 | 0.05 | 11.65 | 0.02 |
| 1.533 | 0.44 | 3.558 | 0.42 | 5.592 | 3.31 | 7.625 | 0.04 | 9.65 | 0.05 | 11.68 | 0.05 |
| 1.567 | 0.44 | 3.6 | 0.47 | 5.625 | 4.14 | 7.658 | 0.04 | 9.683 | 0.04 | 11.72 | 0.05 |
| 1.6 | 0.44 | 3.633 | 0.41 | 5.658 | 4.85 | 7.692 | 0.03 | 9.725 | 0.04 | 11.75 | 0.05 |
| 1.633 | 0.43 | 3.667 | 0.4 | 5.7 | 5.04 | 7.725 | 0.03 | 9.758 | 0.03 | 11.78 | 0.04 |
| 1.675 | 0.44 | 3.7 | 0.38 | 5.733 | 4.13 | 7.758 | 0.03 | 9.792 | 0.03 | 11.83 | 0.04 |
| 1.708 | 0.44 | 3.733 | 0.42 | 5.767 | 3.35 | 7.8 | 0.02 | 9.825 | 0.03 | 11.86 | 0.03 |

| Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) |
|----------|-----------|----------|-----------|----------|-----------|----------|-----------|----------|-----------|----------|-----------|
| 0.025 | 7.56 | 2.05 | 0.51 | 4.083 | 0.12 | 6.117 | 0.56 | 8.142 | 0.05 | 10.18 | 0.04 |
| 0.058 | 6.84 | 2.092 | 0.25 | 4.117 | 0.26 | 6.15 | 0.2 | 8.175 | 0.05 | 10.21 | 0.05 |
| 0.092 | 0.89 | 2.125 | 0.28 | 4.15 | 0.33 | 6.183 | 0.05 | 8.217 | 0.05 | 10.24 | 0.05 |
| 0.125 | 0.73 | 2.158 | 0.22 | 4.192 | 0.46 | 6.217 | 0.05 | 8.25 | 0.05 | 10.28 | 0.05 |
| 0.167 | 0.78 | 2.192 | 0.3 | 4.225 | 0.19 | 6.25 | 0.05 | 8.283 | 0.05 | 10.32 | 0.05 |
| 0.2 | 0.47 | 2.225 | 0.26 | 4.258 | 0.49 | 6.292 | 0.05 | 8.317 | 0.05 | 10.35 | 0.05 |
| 0.233 | 0.63 | 2.267 | 0.71 | 4.292 | 0.32 | 6.325 | 0.04 | 8.35 | 0.05 | 10.38 | 0.04 |
| 0.267 | 0.64 | 2.3 | 0.28 | 4.325 | 0.46 | 6.358 | 0.05 | 8.392 | 0.05 | 10.42 | 0.05 |
| 0.3 | 0.69 | 2.333 | 0.33 | 4.367 | 0.37 | 6.392 | 0.05 | 8.425 | 0.05 | 10.45 | 0.05 |
| 0.342 | 0.54 | 2.367 | 0.18 | 4.4 | 0.45 | 6.425 | 0.05 | 8.458 | 0.05 | 10.49 | 0.05 |
| 0.375 | 0.43 | 2.4 | 0.2 | 4.433 | 0.2 | 6.467 | 0.05 | 8.492 | 0.05 | 10.53 | 0.05 |
| 0.408 | 0.74 | 2.442 | 0.13 | 4.467 | 0.24 | 6.5 | 0.05 | 8.525 | 0.05 | 10.56 | 0.05 |
| 0.442 | 0.35 | 2.475 | 0.28 | 4.5 | 0.37 | 6.533 | 0.05 | 8.567 | 0.05 | 10.59 | 0.04 |
| 0.475 | 0.45 | 2.508 | 0.12 | 4.542 | 0.14 | 6.567 | 0.05 | 8.6 | 0.05 | 10.63 | 0.05 |
| 0.517 | 0.28 | 2.542 | 0.25 | 4.575 | 0.23 | 6.6 | 0.05 | 8.633 | 0.05 | 10.67 | 0.05 |
| 0.55 | 0.39 | 2.575 | 0.24 | 4.608 | 0.44 | 6.642 | 0.04 | 8.667 | 0.05 | 10.7 | 0.05 |
| 0.583 | 0.68 | 2.617 | 0.49 | 4.642 | 0.14 | 6.675 | 0.05 | 8.7 | 0.05 | 10.73 | 0.05 |
| 0.617 | 0.32 | 2.65 | 0.47 | 4.675 | 0.24 | 6.708 | 0.05 | 8.742 | 0.05 | 10.77 | 0.05 |
| 0.65 | 0.33 | 2.683 | 0.2 | 4.717 | 1.11 | 6.742 | 0.05 | 8.775 | 0.05 | 10.8 | 0.04 |
| 0.692 | 0.27 | 2.717 | 0.49 | 4.75 | 1.29 | 6.775 | 0.05 | 8.808 | 0.05 | 10.84 | 0.05 |
| 0.725 | 0.51 | 2.75 | 0.34 | 4.783 | 2.02 | 6.817 | 0.05 | 8.842 | 0.05 | 10.88 | 0.05 |
| 0.758 | 0.32 | 2.792 | 0.29 | 4.817 | 2.91 | 6.85 | 0.04 | 8.875 | 0.05 | 10.91 | 0.05 |
| 0.792 | 0.47 | 2.825 | 0.24 | 4.85 | 3.55 | 6.883 | 0.05 | 8.917 | 0.05 | 10.94 | 0.05 |
| 0.825 | 0.3 | 2.858 | 0.13 | 4.892 | 4.13 | 6.917 | 0.05 | 8.95 | 0.05 | 10.98 | 0.05 |
| 0.867 | 0.31 | 2.892 | 0.25 | 4.925 | 4.57 | 6.95 | 0.05 | 8.983 | 0.05 | 11.02 | 0.04 |
| 0.9 | 0.37 | 2.925 | 0.35 | 4.958 | 4.98 | 6.992 | 0.05 | 9.017 | 0.05 | 11.05 | 0.05 |
| 0.933 | 0.38 | 2.967 | 0.18 | 4.992 | 5.35 | 7.025 | 0.05 | 9.05 | 0.05 | 11.08 | 0.05 |
| 0.967 | 0.35 | 3 | 0.25 | 5.025 | 5.56 | 7.058 | 0.04 | 9.092 | 0.05 | 11.12 | 0.05 |
| 1 | 0.39 | 3.033 | 0.31 | 5.067 | 6.1 | 7.092 | 0.05 | 9.125 | 0.05 | 11.15 | 0.05 |
| 1.042 | 0.34 | 3.067 | 0.2 | 5.1 | 6.26 | 7.125 | 0.05 | 9.158 | 0.05 | 11.19 | 0.05 |
| 1.075 | 0.34 | 3.1 | 0.15 | 5.133 | 6.39 | 7.167 | 0.05 | 9.192 | 0.05 | 11.23 | 0.04 |
| 1.108 | 0.33 | 3.142 | 0.28 | 5.167 | 6.44 | 7.2 | 0.05 | 9.225 | 0.05 | 11.26 | 0.05 |
| 1.142 | 0.3 | 3.175 | 0.18 | 5.2 | 6.49 | 7.233 | 0.05 | 9.267 | 0.05 | 11.29 | 0.05 |
| 1.175 | 0.35 | 3.208 | 0.26 | 5.242 | 6.5 | 7.267 | 0.04 | 9.3 | 0.05 | 11.33 | 0.05 |
| 1.217 | 0.5 | 3.242 | 0.26 | 5.275 | 6.49 | 7.3 | 0.05 | 9.333 | 0.05 | 11.37 | 0.05 |
| 1.25 | 0.71 | 3.275 | 0.18 | 5.308 | 6.52 | 7.342 | 0.05 | 9.367 | 0.05 | 11.4 | 0.05 |
| 1.283 | 0.54 | 3.317 | 0.18 | 5.342 | 6.54 | 7.375 | 0.05 | 9.4 | 0.05 | 11.43 | 0.04 |
| 1.317 | 0.5 | 3.35 | 0.2 | 5.375 | 6.53 | 7.408 | 0.05 | 9.442 | 0.05 | 11.47 | 0.05 |
| 1.35 | 0.32 | 3.383 | 0.08 | 5.417 | 6.54 | 7.442 | 0.05 | 9.475 | 0.05 | 11.5 | 0.05 |
| 1.392 | 0.46 | 3.417 | 0.25 | 5.45 | 6.55 | 7.475 | 0.04 | 9.508 | 0.05 | 11.54 | 0.05 |
| 1.425 | 0.28 | 3.45 | 0.15 | 5.483 | 6.55 | 7.517 | 0.05 | 9.542 | 0.05 | 11.58 | 0.05 |
| 1.458 | 0.46 | 3.492 | 0.49 | 5.517 | 6.52 | 7.55 | 0.05 | 9.575 | 0.05 | 11.61 | 0.05 |
| 1.492 | 0.21 | 3.525 | 0.38 | 5.55 | 6.56 | 7.583 | 0.05 | 9.617 | 0.05 | 11.64 | 0.04 |
| 1.525 | 0.84 | 3.558 | 0.07 | 5.592 | 6.52 | 7.617 | 0.05 | 9.65 | 0.05 | 11.68 | 0.05 |
| 1.567 | 0.42 | 3.592 | 0.31 | 5.625 | 6.54 | 7.65 | 0.05 | 9.683 | 0.05 | 11.72 | 0.05 |
| 1.6 | 0.49 | 3.625 | 0.14 | 5.658 | 6.53 | 7.692 | 0.05 | 9.717 | 0.05 | 11.75 | 0.05 |
| 1.633 | 0.54 | 3.667 | 0.13 | 5.692 | 6.54 | 7.725 | 0.05 | 9.75 | 0.05 | 11.78 | 0.05 |
| 1.667 | 0.37 | 3.7 | 0.6 | 5.725 | 6.49 | 7.758 | 0.05 | 9.792 | 0.05 | 11.82 | 0.04 |
| 1.7 | 0.28 | 3.733 | 0.24 | 5.767 | 6.47 | 7.792 | 0.05 | 9.825 | 0.05 | 11.85 | 0.05 |
| 1.742 | 0.3 | 3.767 | 0.41 | 5.8 | 6.47 | 7.825 | 0.05 | 9.858 | 0.05 | 11.89 | 0.05 |
| 1.775 | 0.28 | 3.8 | 0.25 | 5.833 | 6.36 | 7.867 | 0.05 | 9.892 | 0.05 | 11.93 | 0.05 |
| 1.808 | 0.53 | 3.842 | 0.37 | 5.867 | 5.19 | 7.9 | 0.05 | 9.925 | 0.05 | 11.96 | 0.05 |
| 1.842 | 0.36 | 3.875 | 0.27 | 5.9 | 4.18 | 7.933 | 0.05 | 9.967 | 0.04 | 11.99 | 0.05 |
| 1.875 | 0.31 | 3.908 | 0.27 | 5.942 | 3.23 | 7.967 | 0.05 | 10 | 0.05 | | |
| 1.917 | 0.19 | 3.942 | 0.27 | 5.975 | 2.62 | 8 | 0.05 | 10.03 | 0.05 | | |

| Calibration Carbon Cycle Evolution Oxygen | | | | | |
|---|-----------|----------|-----------|----------|-----------|
| | | | | | |
| Sim | | | | | |
| Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) |
| 12 | 1E-06 | 17 | 1E-06 | 20 | 0.3906 |
| 12.01 | 0.3015 | 17.01 | 0.3449 | 20.01 | 0.3936 |
| 12.02 | 0.3069 | 17.02 | 0.3498 | 20.02 | 0.3966 |
| 12.03 | 0.3124 | 17.03 | 0.3547 | 20.03 | 0.3996 |
| 12.04 | 0.3181 | 17.04 | 0.3596 | 20.04 | 0.4025 |
| 12.05 | 0.3238 | 17.05 | 0.3645 | 20.05 | 0.4054 |
| 12.06 | 0.3295 | 17.06 | 0.3694 | 20.06 | 0.4083 |
| 12.07 | 0.3353 | 17.07 | 0.3743 | 20.07 | 0.4112 |
| 12.08 | 0.3409 | 17.08 | 0.3792 | 20.08 | 0.4141 |
| 12.09 | 0.3465 | 17.09 | 0.3841 | 20.09 | 0.4171 |
| 12.1 | 0.3519 | 17.1 | 0.389 | 20.1 | 0.4202 |
| 12.11 | 0.3572 | 17.11 | 0.3938 | 20.11 | 0.4236 |
| 12.12 | 0.3622 | 17.12 | 0.3988 | 20.12 | 0.4273 |
| 12.13 | 0.367 | 17.13 | 0.4037 | 20.13 | 0.4317 |
| 12.14 | 0.3716 | 17.14 | 0.4088 | 20.14 | 0.437 |
| 12.15 | 0.3758 | 17.15 | 0.414 | 20.15 | 0.4443 |
| 12.16 | 0.3799 | 17.16 | 0.4196 | 20.16 | 0.4554 |
| 12.17 | 0.3836 | 17.17 | 0.4258 | 20.17 | 0.4759 |
| 12.18 | 0.3871 | 17.18 | 0.433 | 20.18 | 0.531 |
| 12.19 | 0.3904 | 17.19 | 0.4421 | 20.19 | 1.0897 |
| 12.2 | 0.3934 | 17.2 | 0.455 | 20.2 | 6.0005 |
| 12.21 | 0.3963 | 17.21 | 0.4774 | 20.21 | 6.0354 |
| 12.22 | 0.3991 | 17.22 | 0.5322 | 20.22 | 6.0435 |
| 12.23 | 0.4018 | 17.23 | 0.9097 | 20.23 | 6.0517 |
| 12.24 | 0.4046 | 17.24 | 5.9245 | 20.24 | 6.0599 |
| 12.25 | 0.4075 | 17.25 | 6.0928 | 20.25 | 0 |
| 12.26 | 2E-72 | 17.26 | 1E-30 | 20.26 | 0 |
| 12.27 | 9E-174 | 17.27 | 4E-121 | 20.27 | 0 |
| 12.28 | 6E-294 | 17.28 | 6E-268 | 20.28 | 0 |
| 12.29 | 0 | 17.29 | 0 | 20.29 | 0 |
| 12.3 | 0 | 17.3 | 0 | 20.3 | 0 |
| 12.31 | 0 | 17.31 | 0 | 20.31 | 0 |
| 12.32 | 0 | 17.32 | 0 | 20.32 | 0 |
| 12.33 | 0 | 17.33 | 0 | 20.33 | 0 |
| 12.34 | 0 | 17.34 | 0 | 20.34 | 0 |
| 12.35 | 0 | 17.35 | 0 | 20.35 | 0 |
| 12.36 | 0 | 17.36 | 0 | 20.36 | 0 |
| 12.37 | 0 | 17.37 | 0 | 20.37 | 0 |
| 12.38 | 0 | 17.38 | 0 | 20.38 | 0 |
| 12.39 | 0 | 17.39 | 0 | 20.39 | 0 |
| 12.4 | 0 | 17.4 | 0 | 20.4 | 0 |
| 12.41 | 0 | 17.41 | 0 | 20.41 | 0 |
| 12.42 | 0 | 17.42 | 0 | 20.42 | 0 |
| 12.43 | 0 | 17.43 | 0 | 20.43 | 0 |
| 12.44 | 0 | 17.44 | 0 | 20.44 | 0 |
| 12.45 | 0 | 17.45 | 0 | 20.45 | 0 |
| 12.46 | 0 | 17.46 | 0 | 20.46 | 0 |
| 12.47 | 0 | 17.47 | 0 | 20.47 | 0 |
| 12.48 | 0 | 17.48 | 0 | 20.48 | 0 |
| 12.49 | 0 | 17.49 | 0 | 20.49 | 0 |
| 12.5 | 0 | 17.5 | 0 | 20.5 | 0 |

| Validation Carbon Longterm Evolution Beginning of Cycle | | | | | | | | | |
|---|-------|-------|-------|-----------|------|-------|-------|-----------|------------------|
| Time (d) | Sim | | | | Exp | | | | |
| | S_NH | S_NO2 | S_NO3 | SND ratio | S_NH | S_NO2 | S_NO3 | SND ratio | NO2 accumulation |
| 0.25 | 146.8 | 0.1 | 0.0 | | | | 0.00 | | |
| 1.25 | 247.8 | 0.1 | 0.3 | | | | 0.06 | | |
| 2.25 | 310.4 | 0.3 | 0.3 | | | | 0.44 | | |
| 3.25 | 324.7 | 0.3 | 0.3 | 312 | 0.1 | 0.3 | 0.54 | 0.42 | 0.95 |
| 4.25 | 323.2 | 0.4 | 0.2 | | | | 0.59 | | |
| 5.25 | 160.3 | 1.9 | 0.1 | | | | 0.68 | | |
| 6.25 | 108.1 | 2.2 | 0.1 | | | | 0.66 | | |
| 7.25 | 95.8 | 2.8 | 0.0 | | | | 0.69 | | |
| 8.25 | 230.9 | 1.8 | 0.0 | | | | 0.74 | | |
| 9.25 | 248.2 | 2.0 | 0.0 | 261 | 0.5 | 1.1 | 0.74 | 0.71 | 0.96 |
| 10.25 | 246.5 | 2.4 | 0.0 | | | | 0.77 | | |
| 11.25 | 170.8 | 3.3 | 0.0 | | | | 0.75 | | |
| 12.25 | 159.4 | 3.5 | 0.0 | | | | 0.69 | | |
| 13.25 | 159.2 | 3.8 | 2.4 | | | | 0.69 | | |
| 14.25 | 300.9 | 3.1 | 2.5 | | | | 0.73 | | |
| 15.25 | 309.6 | 3.1 | 0.0 | | | | 0.77 | | |
| 16.25 | 307.6 | 3.3 | 0.0 | 322 | 0.17 | 0.3 | 0.76 | 0.77 | 0.81 |
| 17.25 | 303.2 | 3.5 | 0.0 | | | | 0.75 | | |
| 18.25 | 300.3 | 3.6 | 0.0 | | | | 0.73 | | |
| 19.25 | 300.9 | 3.7 | 0.0 | | | | 0.71 | | |
| 20.25 | 301.0 | 4.0 | 0.0 | | | | 0.70 | | |
| | | | | | | | 0.63 | 0.63 | 0.91 |

| Validation Carbon Longterm Evolution End of Cycle | | | | | | | | | |
|---|-------|-------|-------|------|-------|-------|------|-------|-------|
| Time (d) | Sim | | | Exp | | | S_NH | S_NO2 | S_NO3 |
| | S_NH | S_NO2 | S_NO3 | S_NH | S_NO2 | S_NO3 | | | |
| 0.75 | 113.4 | 0 | 0 | | | | | | |
| 1.75 | 198.8 | 0 | 0 | | | | | | |
| 2.75 | 249.2 | 0 | 0 | | | | | | |
| 3.75 | 247.2 | 0 | 0 | | | | | | |
| 4.75 | 229.2 | 0 | 0 | | 0.1 | 0.23 | | | |
| 5.75 | 50.6 | 0 | 0 | | | | | | |
| 6.75 | 7.9 | 0 | 0 | | | | | | |
| 7.75 | 7.5 | 0 | 0 | | | | | | |
| 8.75 | 68.3 | 0 | 0 | | | | | | |
| 9.75 | 65.3 | 0 | 0 | | | | | | |
| 10.75 | 50.3 | 0 | 0 | | 0.05 | 0.12 | | | |
| 11.75 | 14.9 | 0 | 1 | | | | | | |
| 12.75 | 15.1 | 0 | 10 | | | | | | |
| 13.75 | 16.1 | 0 | 14 | | | | | | |
| 14.75 | 44.0 | 0 | 0 | | | | | | |
| 15.75 | 39.0 | 0 | 0 | | | | | | |
| 16.75 | 25.6 | 0 | 0 | | 0.23 | 0.12 | | | |
| 17.75 | 17.1 | 0 | 0 | | | | | | |
| 18.75 | 21.2 | 0 | 0 | | | | | | |
| 19.75 | 23.5 | 0 | 0 | | | | | | |

| Validation Carbon Long term Evolution End of Nitrification | | | | | | | | | |
|--|-------|-------|-------|------|-------|-------|--------|----------|----------|
| Time (d) | Sim | | | Exp | | | ARD | | |
| | S_NH | S_NO2 | S_NO3 | S_NH | S_NO2 | S_NO3 | | | |
| 0.25 | 113.6 | 0.2 | 0.0 | | | | | | |
| 1.25 | 199.0 | 3.1 | 0.1 | | | | | | |
| 2.25 | 245.9 | 28.6 | 0.7 | | | | | | |
| 3.25 | 242.4 | 44.2 | 1.0 | 260 | 21 | 1.3 | 0.068 | 1.107 | 0.213 |
| 4.25 | 223.1 | 58.0 | 1.4 | | | | | | |
| 5.25 | 42.2 | 79.4 | 2.6 | | | | | | |
| 6.25 | 0.0 | 63.2 | 10.9 | | | | | | |
| 7.25 | 0.0 | 51.7 | 17.5 | | | | | | |
| 8.25 | 60.6 | 123.1 | 4.9 | | | | | | |
| 9.25 | 61.5 | 130.2 | 9.6 | 64 | 134 | 6.5 | 0.039 | 0.028 | 0.477 |
| 10.25 | 44.4 | 142.5 | 15.2 | | | | | | |
| 11.25 | 0.0 | 95.7 | 36.0 | | | | | | |
| 12.25 | 0.0 | 71.2 | 42.5 | | | | | | |
| 13.25 | 0.0 | 68.0 | 47.5 | | | | | | |
| 14.25 | 35.1 | 174.3 | 24.2 | | | | | | |
| 15.25 | 28.5 | 190.1 | 28.0 | | | | | | |
| 16.25 | 12.4 | 193.8 | 34.7 | 21 | 187 | 45.1 | 0.407 | 0.036 | 0.231 |
| 17.25 | 0.0 | 188.5 | 42.6 | | | | | | |
| 18.25 | 0.0 | 169.8 | 52.4 | | | | | | |
| 19.25 | 0.0 | 159.6 | 58.1 | | | | | | |
| 20.25 | 0.0 | 153.4 | 62.0 | | | | | | |
| | | | | | | | 0.171 | 0.390 | 0.307 |
| Validation Carbon Long term Evolution End of Denitrification | | | | | | | | | |
| Time (d) | Sim | | | Exp | | | ARD | | |
| | S_NH | S_NO2 | S_NO3 | S_NH | S_NO2 | S_NO3 | | | |
| 0.34 | 113.4 | 0 | 0 | | | | | | |
| 1.34 | 198.8 | 0 | 0 | | | | | | |
| 2.34 | 249.2 | 0 | 0 | | | | | | |
| 3.34 | 247.2 | 0 | 0 | 261 | 2.7 | 0.2 | 0.0528 | 0.999078 | 0.999966 |
| 4.34 | 229.2 | 0.1 | 0 | | | | | | |
| 5.34 | 50.8 | 2.9 | 0 | | | | | | |
| 6.34 | 7.849 | 0 | 0 | | | | | | |
| 7.34 | 7.47 | 0 | 0 | | | | | | |
| 8.34 | 69.88 | 16.1 | 0 | | | | | | |
| 9.34 | 66.91 | 17.2 | 0 | 51 | 18.8 | 1.2 | 0.312 | 0.087665 | 1 |
| 10.34 | 51.9 | 16.5 | 0 | | | | | | |
| 11.34 | 14.75 | 0 | 0 | | | | | | |
| 12.34 | 14.91 | 0 | 0 | | | | | | |
| 13.34 | 15.95 | 0 | 0 | | | | | | |
| 14.34 | 45.39 | 13.3 | 0 | | | | | | |
| 15.34 | 40.71 | 16.6 | 0 | | | | | | |
| 16.34 | 26.62 | 9.6 | 0 | 29 | 12.1 | 0.3 | 0.0821 | 0.20783 | 1 |
| 17.34 | 8.8 | 0 | 0 | | | | | | |
| 18.34 | 8.58 | 0 | 0 | | | | | | |
| 19.34 | 8.08 | 0 | 0 | | | | | | |
| 20.34 | 7.64 | 0 | 0 | | | | | | |
| | | | | | | | 0.149 | 0.431524 | 0.999989 |

| Validation Carbon Long term Evolution Carbon addition | | | | | | |
|---|----------|--------|--|--|--|--|
| | Sim | Exp | | | | |
| Time (d) | C(S_S) | C(S_S) | | | | |
| 1.28 | 221.0523 | | | | | |
| 2.28 | 250.5481 | | | | | |
| 3.28 | 259.0712 | 86 | | | | |
| 4.28 | 261.1414 | | | | | |
| 5.28 | 156.1772 | | | | | |
| 6.28 | 125.8715 | | | | | |
| 7.28 | 117.5397 | | | | | |
| 8.28 | 207.2575 | | | | | |
| 9.28 | 233.1676 | 607 | | | | |
| 10.28 | 240.3544 | | | | | |
| 11.28 | 182.1889 | | | | | |
| 12.28 | 165.3893 | | | | | |
| 13.28 | 160.9137 | | | | | |
| 14.28 | 252.4401 | | | | | |
| 15.28 | 278.8686 | | | | | |
| 16.28 | 286.4097 | 921 | | | | |
| 17.28 | 288.5612 | | | | | |
| 18.28 | 289.175 | | | | | |
| 19.28 | 289.3502 | | | | | |
| 20.28 | 289.4001 | | | | | |

| Validation Carbon Cycle Evolution Nutrient | | | | | | | |
|--|----------|-------|-------|-------|------|-------|-------|
| Time (h) | Time (d) | Sim | | | Exp | | |
| | | S_NH | S_NO2 | S_NO3 | S_NH | S_NO2 | S_NO3 |
| 0 | 16.02 | 295.5 | 9.4 | 0.9 | 0 | 0 | 0 |
| 0.24 | 16.03 | 283.4 | 15.5 | 2.1 | | | |
| 0.48 | 16.04 | 271.3 | 21.6 | 3.4 | | | |
| 0.72 | 16.05 | 259.1 | 28.1 | 4.7 | | | |
| 0.96 | 16.06 | 247.0 | 34.7 | 6.1 | | | |
| 1.2 | 16.07 | 234.8 | 41.5 | 7.5 | | | |
| 1.44 | 16.08 | 222.6 | 48.6 | 8.9 | | | |
| 1.68 | 16.09 | 210.3 | 55.9 | 10.3 | | | |
| 1.92 | 16.1 | 198.1 | 63.4 | 11.7 | 247 | 78 | 8.9 |
| 2.16 | 16.11 | 185.8 | 71.1 | 13.1 | | | |
| 2.4 | 16.12 | 173.5 | 79.0 | 14.6 | | | |
| 2.64 | 16.13 | 161.1 | 87.0 | 16.0 | | | |
| 2.88 | 16.14 | 148.8 | 95.3 | 17.5 | | | |
| 3.12 | 16.15 | 136.4 | 103.7 | 19.0 | | | |
| 3.36 | 16.16 | 124.0 | 112.2 | 20.5 | | | |
| 3.6 | 16.17 | 111.6 | 120.9 | 22.0 | | | |
| 3.84 | 16.18 | 99.2 | 129.7 | 23.5 | 102 | 134 | 28.9 |
| 4.08 | 16.19 | 86.8 | 138.6 | 25.0 | | | |
| 4.32 | 16.2 | 74.3 | 147.7 | 26.6 | | | |
| 4.56 | 16.21 | 61.9 | 156.8 | 28.1 | | | |
| 4.8 | 16.22 | 49.4 | 166.0 | 29.7 | | | |
| 5.04 | 16.23 | 37.0 | 175.3 | 31.3 | | | |
| 5.28 | 16.24 | 24.6 | 184.6 | 32.9 | | | |
| 5.52 | 16.25 | 12.4 | 193.8 | 34.7 | | | |
| 5.76 | 16.26 | 12.3 | 189.8 | 34.6 | 6.7 | 203 | 17.6 |
| 6 | 16.27 | 17.3 | 166.2 | 23.6 | | | |
| 6.24 | 16.28 | 22.1 | 139.4 | 12.1 | | | |
| 6.48 | 16.29 | 26.7 | 110.3 | 0.6 | | | |
| 6.72 | 16.3 | 28.5 | 79.2 | 0 | | | |
| 6.96 | 16.31 | 29.8 | 46.7 | 0 | 7.9 | 1600 | 5.7 |
| 7.2 | 16.32 | 28.7 | 29.4 | 0 | | | |
| 7.44 | 16.33 | 27.2 | 15.7 | 0 | | | |
| 7.68 | 16.34 | 26.6 | 9.6 | 0 | | | |
| 7.92 | 16.35 | 26.4 | 7.0 | 0 | 8.2 | 1700 | 568 |
| 8.16 | 16.36 | 26.1 | 4.4 | 0 | | | |
| 8.4 | 16.37 | 25.9 | 2.1 | 0 | | | |
| 8.64 | 16.38 | 25.7 | 0.3 | 0 | | | |
| 8.88 | 16.39 | 25.6 | 0.0 | 0 | | | |
| 9.12 | 16.4 | 25.6 | 0 | 0 | | | |
| 9.36 | 16.41 | 25.6 | 0 | 0 | | | |
| 9.6 | 16.42 | 25.5 | 0 | 0 | | | |
| 9.84 | 16.43 | 25.5 | 0 | 0 | | | |
| 10.08 | 16.44 | 25.5 | 0 | 0 | | | |
| 10.32 | 16.45 | 25.6 | 0 | 0 | | | |
| 10.56 | 16.46 | 25.6 | 0 | 0 | | | |
| 10.8 | 16.47 | 25.6 | 0 | 0 | | | |
| 11.04 | 16.48 | 25.6 | 0 | 0 | | | |
| 11.28 | 16.49 | 25.6 | 0 | 0 | | | |
| 11.52 | 16.5 | 25.6 | 0 | 0 | | | |
| 11.76 | 16.51 | 25.6 | 0 | 0 | | 0.2 | 0.4 |
| 12 | 16.52 | 25.6 | 0 | 0 | | | |
| 12.24 | 16.53 | 25.6 | 0 | 0 | | | |
| 12.48 | 16.54 | 25.6 | 0 | 0 | | | |
| 12.72 | 16.55 | 25.6 | 0 | 0 | | | |
| 12.96 | 16.56 | 25.6 | 0 | 0 | | | |

| Time (h) | Time (d) | S_NH | S_NO2 | S_NO3 | S_NH | S_NO2 | S_NO3 |
|----------|----------|-------|-------|-------|------|-------|-------|
| 14.64 | 16.63 | 25.6 | 0 | 0 | | | |
| 14.88 | 16.64 | 25.6 | 0 | 0 | | | |
| 15.12 | 16.65 | 25.6 | 0 | 0 | | | |
| 15.36 | 16.66 | 25.6 | 0 | 0 | | | |
| 15.6 | 16.67 | 25.6 | 0 | 0 | | | |
| 15.84 | 16.68 | 25.6 | 0 | 0 | | | |
| 16.08 | 16.69 | 25.6 | 0 | 0 | | | |
| 16.32 | 16.7 | 25.6 | 0 | 0 | | | |
| 16.56 | 16.71 | 25.6 | 0 | 0 | | | |
| 16.8 | 16.72 | 25.6 | 0 | 0 | | | |
| 17.04 | 16.73 | 25.6 | 0 | 0 | | | |
| 17.28 | 16.74 | 25.6 | 0 | 0 | | | |
| 17.52 | 16.75 | 25.6 | 0 | 0 | | | |
| 17.76 | 16.76 | 25.6 | 0 | 0 | | | |
| 18 | 16.77 | 25.6 | 0 | 0 | | | |
| 18.24 | 16.78 | 25.6 | 0 | 0 | | | |
| 18.48 | 16.79 | 25.6 | 0 | 0 | | | |
| 18.72 | 16.8 | 25.6 | 0 | 0 | | | |
| 18.96 | 16.81 | 25.6 | 0 | 0 | | | |
| 19.2 | 16.82 | 25.6 | 0 | 0 | | | |
| 19.44 | 16.83 | 25.6 | 0 | 0 | | | |
| 19.68 | 16.84 | 25.6 | 0 | 0 | | | |
| 19.92 | 16.85 | 25.6 | 0 | 0 | | | |
| 20.16 | 16.86 | 25.6 | 0 | 0 | | | |
| 20.4 | 16.87 | 25.6 | 0 | 0 | | | |
| 20.64 | 16.88 | 25.6 | 0 | 0 | | | |
| 20.88 | 16.89 | 25.6 | 0 | 0 | | | |
| 21.12 | 16.9 | 25.6 | 0 | 0 | | | |
| 21.36 | 16.91 | 25.6 | 0 | 0 | | | |
| 21.6 | 16.92 | 25.6 | 0 | 0 | | | |
| 21.84 | 16.93 | 25.6 | 0 | 0 | | | |
| 22.08 | 16.94 | 25.6 | 0 | 0 | | | |
| 22.32 | 16.95 | 25.6 | 0 | 0 | | | |
| 22.56 | 16.96 | 25.6 | 0 | 0 | | | |
| 22.8 | 16.97 | 25.6 | 0 | 0 | | | |
| 23.04 | 16.98 | 25.6 | 0 | 0 | | | |
| 23.28 | 16.99 | 25.6 | 0 | 0 | | | |
| 23.52 | 17 | 25.6 | 0 | 0 | | | |
| 23.76 | 17.01 | 303.2 | 3 | 0 | | | |
| 24 | 21 | 9.4 | 0 | | | | |

| Validation Carbon Cycle Evolution Oxygen | | | | | | | | | | | |
|--|-----------|----------|-----------|----------|-----------|----------|-----------|----------|-----------|----------|-----------|
| Exp | | | | | | | | | | | |
| Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (s) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) |
| 0.00 | 8.59 | 0.917 | 0.47 | 1.833 | 0.47 | 6600 | 0.32 | 3.67 | 0.52 | 4.633 | 0.39 |
| 0.02 | 0.62 | 0.933 | 0.49 | 1.850 | 0.38 | 6660 | 0.35 | 3.68 | 0.64 | 4.650 | 0.45 |
| 0.03 | 0.62 | 0.950 | 0.47 | 1.867 | 0.36 | 6720 | 0.39 | 3.70 | 0.69 | 4.667 | 0.4 |
| 0.05 | 0.51 | 0.967 | 0.45 | 1.883 | 0.49 | 6780 | 0.33 | 3.72 | 0.48 | 4.683 | 0.44 |
| 0.07 | 0.51 | 0.983 | 0.42 | 1.900 | 0.35 | 6840 | 0.35 | 3.73 | 0.47 | 4.700 | 0.49 |
| 0.08 | 0.46 | 1.000 | 0.41 | 1.917 | 0.38 | 6900 | 0.34 | 3.75 | 0.57 | 4.717 | 0.44 |
| 0.10 | 0.48 | 1.017 | 0.41 | 1.933 | 0.34 | 6960 | 0.45 | 3.77 | 0.52 | 4.733 | 0.35 |
| 0.12 | 0.52 | 1.033 | 0.4 | 1.950 | 0.37 | 7020 | 0.32 | 3.78 | 0.55 | 4.750 | 0.36 |
| 0.13 | 0.47 | 1.050 | 0.39 | 1.967 | 0.36 | 7080 | 0.32 | 3.80 | 0.39 | 4.767 | 0.49 |
| 0.15 | 0.46 | 1.067 | 0.4 | 1.983 | 0.34 | 7140 | 0.33 | 3.82 | 0.38 | 4.783 | 0.64 |
| 0.17 | 0.5 | 1.083 | 0.38 | 2.000 | 0.36 | 7200 | 0.34 | 3.83 | 0.38 | 4.800 | 0.49 |
| 0.18 | 0.44 | 1.100 | 0.37 | 2.017 | 0.34 | 7260 | 0.34 | 3.85 | 0.52 | 4.817 | 0.45 |
| 0.20 | 0.43 | 1.117 | 0.38 | 2.033 | 0.33 | 7320 | 0.47 | 3.87 | 0.49 | 4.833 | 0.6 |
| 0.22 | 0.42 | 1.133 | 0.37 | 2.050 | 0.34 | 7380 | 0.31 | 3.88 | 0.72 | 4.850 | 0.94 |
| 0.23 | 0.43 | 1.150 | 0.35 | 2.067 | 0.33 | 7440 | 0.33 | 3.90 | 0.5 | 4.867 | 0.68 |
| 0.25 | 0.41 | 1.167 | 0.34 | 2.083 | 0.6 | 7500 | 0.34 | 3.92 | 0.42 | 4.883 | 0.84 |
| 0.27 | 0.41 | 1.183 | 0.35 | 2.100 | 0.34 | 7560 | 0.35 | 3.93 | 0.57 | 4.900 | 0.61 |
| 0.28 | 0.39 | 1.200 | 0.4 | 2.117 | 0.36 | 7620 | 0.33 | 3.95 | 0.52 | 4.917 | 0.6 |
| 0.30 | 0.39 | 1.217 | 0.35 | 2.133 | 0.37 | 7680 | 0.35 | 3.97 | 0.5 | 4.933 | 0.47 |
| 0.32 | 0.37 | 1.233 | 0.36 | 2.150 | 0.44 | 7740 | 0.32 | 3.98 | 0.48 | 4.950 | 0.75 |
| 0.33 | 0.38 | 1.250 | 0.34 | 2.167 | 0.41 | 7800 | 0.31 | 4.00 | 0.46 | 4.967 | 0.61 |
| 0.35 | 0.37 | 1.267 | 0.35 | 2.183 | 0.35 | 7860 | 0.35 | 4.02 | 0.55 | 4.983 | 0.43 |
| 0.37 | 0.37 | 1.283 | 0.35 | 2.200 | 0.4 | 7920 | 0.33 | 4.03 | 0.45 | 5.000 | 0.42 |
| 0.38 | 0.35 | 1.300 | 0.33 | 2.217 | 0.4 | 7980 | 0.32 | 4.05 | 0.33 | 5.017 | 0.41 |
| 0.40 | 0.37 | 1.317 | 0.33 | 2.233 | 0.36 | 8040 | 0.4 | 4.07 | 0.71 | 5.033 | 0.47 |
| 0.42 | 0.37 | 1.333 | 0.35 | 2.250 | 0.35 | 8100 | 0.37 | 4.08 | 0.37 | 5.050 | 0.39 |
| 0.43 | 0.36 | 1.350 | 0.32 | 2.267 | 0.45 | 8160 | 0.32 | 4.10 | 0.44 | 5.067 | 0.44 |
| 0.45 | 0.35 | 1.367 | 0.34 | 2.283 | 0.37 | 8220 | 0.36 | 4.12 | 0.66 | 5.083 | 0.46 |
| 0.47 | 0.37 | 1.383 | 0.36 | 2.300 | 0.36 | 8280 | 0.35 | 4.13 | 0.45 | 5.100 | 0.49 |
| 0.48 | 0.39 | 1.400 | 0.34 | 2.317 | 0.33 | 8340 | 0.54 | 4.15 | 0.37 | 5.117 | 0.46 |
| 0.50 | 0.39 | 1.417 | 0.32 | 2.333 | 0.38 | 8400 | 0.34 | 4.17 | 0.58 | 5.133 | 0.42 |
| 0.52 | 0.38 | 1.433 | 0.32 | 2.350 | 0.35 | 8460 | 0.4 | 4.18 | 0.32 | 5.150 | 0.47 |
| 0.53 | 0.37 | 1.450 | 0.32 | 2.367 | 0.38 | 8520 | 0.35 | 4.20 | 0.34 | 5.167 | 0.47 |
| 0.55 | 0.37 | 1.467 | 0.31 | 2.383 | 0.5 | 8580 | 0.41 | 4.22 | 0.41 | 5.183 | 0.39 |
| 0.57 | 0.4 | 1.483 | 0.3 | 2.400 | 0.32 | 8640 | 0.38 | 4.23 | 0.4 | 5.200 | 0.37 |
| 0.58 | 0.38 | 1.500 | 0.36 | 2.417 | 0.33 | 8700 | 0.41 | 4.25 | 0.38 | 5.217 | 0.4 |
| 0.60 | 0.43 | 1.517 | 0.3 | 2.433 | 0.34 | 8760 | 0.41 | 4.27 | 0.54 | 5.233 | 0.4 |
| 0.62 | 0.37 | 1.533 | 0.28 | 2.450 | 0.36 | 8820 | 0.5 | 4.28 | 0.37 | 5.250 | 0.39 |
| 0.63 | 0.38 | 1.550 | 0.32 | 2.467 | 0.33 | 8880 | 0.43 | 4.30 | 0.34 | 5.267 | 0.43 |
| 0.65 | 0.37 | 1.567 | 0.3 | 2.483 | 0.32 | 8940 | 0.41 | 4.32 | 0.33 | 5.283 | 0.38 |
| 0.67 | 0.37 | 1.583 | 0.31 | 2.500 | 0.34 | 9000 | 0.5 | 4.33 | 0.57 | 5.300 | 0.37 |
| 0.68 | 0.38 | 1.600 | 0.49 | 2.517 | 0.32 | 9060 | 0.46 | 4.35 | 0.34 | 5.317 | 0.42 |
| 0.70 | 0.35 | 1.617 | 0.36 | 2.533 | 0.4 | 9120 | 0.39 | 4.37 | 0.44 | 5.333 | 0.38 |
| 0.72 | 0.39 | 1.633 | 0.36 | 2.550 | 0.33 | 9180 | 0.4 | 4.38 | 0.5 | 5.350 | 0.49 |
| 0.73 | 0.36 | 1.650 | 0.38 | 2.567 | 0.33 | 9240 | 0.53 | 4.40 | 0.39 | 5.367 | 0.45 |
| 0.75 | 0.35 | 1.667 | 0.44 | 2.583 | 0.32 | 9300 | 0.42 | 4.42 | 0.36 | 5.383 | 0.49 |
| 0.77 | 0.35 | 1.683 | 0.41 | 2.600 | 0.31 | 9360 | 0.38 | 4.43 | 0.46 | 5.400 | 0.59 |
| 0.78 | 0.33 | 1.700 | 0.46 | 2.617 | 0.35 | 9420 | 0.54 | 4.45 | 0.38 | 5.417 | 0.57 |
| 0.80 | 0.38 | 1.717 | 0.37 | 2.633 | 0.32 | 9480 | 0.54 | 4.47 | 0.58 | 5.433 | 0.61 |
| 0.82 | 0.35 | 1.733 | 0.39 | 2.650 | 0.33 | 9540 | 0.46 | 4.48 | 0.52 | 5.450 | 0.41 |
| 0.83 | 0.6 | 1.750 | 0.4 | 2.667 | 0.34 | 9600 | 0.64 | 4.50 | 0.44 | 5.467 | 0.41 |
| 0.85 | 0.56 | 1.767 | 0.36 | 2.683 | 0.31 | 9660 | 0.41 | 4.52 | 0.37 | 5.483 | 0.35 |
| 0.87 | 0.56 | 1.783 | 0.4 | 2.700 | 0.33 | 9720 | 0.48 | 4.53 | 0.4 | 5.500 | 0.37 |

| Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (s) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) |
|----------|-----------|----------|-----------|----------|-----------|----------|-----------|----------|-----------|----------|-----------|
| 5.600 | 0.33 | 6.567 | 0.04 | 7.53 | 0 | 8.500 | 0.01 | 9.467 | 0.01 | 10.433 | 0 |
| 5.617 | 0.33 | 6.583 | 0.04 | 7.55 | 0 | 8.517 | 0.01 | 9.483 | 0.01 | 10.450 | 0.01 |
| 5.633 | 0.34 | 6.600 | 0.05 | 7.57 | 0.01 | 8.533 | 0.01 | 9.500 | 0 | 10.467 | 0.01 |
| 5.650 | 0.33 | 6.617 | 0.04 | 7.58 | 0 | 8.550 | 0 | 9.517 | 0 | 10.483 | 0.01 |
| 5.667 | 0.33 | 6.633 | 0.04 | 7.60 | 0.01 | 8.567 | 0 | 9.533 | 0 | 10.500 | 0 |
| 5.683 | 0.34 | 6.650 | 0.05 | 7.62 | 0 | 8.583 | 0 | 9.550 | 0 | 10.517 | 0 |
| 5.700 | 0.46 | 6.667 | 0.01 | 7.63 | 0 | 8.600 | 0 | 9.567 | 0 | 10.533 | 0 |
| 5.717 | 0.33 | 6.683 | 0.01 | 7.65 | 0.01 | 8.617 | 0 | 9.583 | 0.01 | 10.550 | 0.01 |
| 5.733 | 0.34 | 6.700 | 0.01 | 7.67 | 0 | 8.633 | 0 | 9.600 | 0.01 | 10.567 | 0.01 |
| 5.750 | 0.35 | 6.717 | 0.01 | 7.68 | 0 | 8.650 | 0 | 9.617 | 0.01 | 10.583 | 0 |
| 5.767 | 0.36 | 6.733 | 0.01 | 7.70 | 0.01 | 8.667 | 0.01 | 9.633 | 0.01 | 10.600 | 0 |
| 5.783 | 0.39 | 6.750 | 0.01 | 7.72 | 0 | 8.683 | 0 | 9.650 | 0 | 10.617 | 0.01 |
| 5.800 | 0.33 | 6.767 | 0.01 | 7.73 | 0 | 8.700 | 0.01 | 9.667 | 0 | 10.633 | 0.01 |
| 5.817 | 0.32 | 6.783 | 0.01 | 7.75 | 0.01 | 8.717 | 0 | 9.683 | 0 | 10.650 | 0 |
| 5.833 | 0.33 | 6.800 | 0.01 | 7.77 | 0.01 | 8.733 | 0 | 9.700 | 0 | 10.667 | 0 |
| 5.850 | 0.33 | 6.817 | 0.01 | 7.78 | 0.01 | 8.750 | 0.01 | 9.717 | 0 | 10.683 | 0.01 |
| 5.867 | 0.31 | 6.833 | 0.01 | 7.80 | 0.01 | 8.767 | 0 | 9.733 | 0 | 10.700 | 0.01 |
| 5.883 | 0.32 | 6.850 | 0.01 | 7.82 | 0.01 | 8.783 | 0 | 9.750 | 0 | 10.717 | 0 |
| 5.900 | 0.31 | 6.867 | 0.01 | 7.83 | 0.01 | 8.800 | 0.01 | 9.767 | 0.01 | 10.733 | 0 |
| 5.917 | 0.31 | 6.883 | 0.01 | 7.85 | 0.01 | 8.817 | 0 | 9.783 | 0 | 10.750 | 0.01 |
| 5.933 | 0.32 | 6.900 | 0.01 | 7.87 | 0.01 | 8.833 | 0 | 9.800 | 0.01 | 10.767 | 0 |
| 5.950 | 0.33 | 6.917 | 0.01 | 7.88 | 0.01 | 8.850 | 0.01 | 9.817 | 0 | 10.783 | 0 |
| 5.967 | 0.37 | 6.933 | 0.01 | 7.90 | 0.01 | 8.867 | 0.01 | 9.833 | 0 | 10.800 | 0 |
| 5.983 | 0.32 | 6.950 | 0.01 | 7.92 | 0.01 | 8.883 | 0.01 | 9.850 | 0.01 | 10.817 | 0.01 |
| 6.000 | 0.34 | 6.967 | 0 | 7.93 | 0.01 | 8.900 | 0.01 | 9.867 | 0 | 10.833 | 0.01 |
| 6.017 | 0.33 | 6.983 | 0.01 | 7.95 | 0.01 | 8.917 | 0.01 | 9.883 | 0 | 10.850 | 0 |
| 6.033 | 0.32 | 7.000 | 0 | 7.97 | 0.01 | 8.933 | 0.01 | 9.900 | 0.01 | 10.867 | 0 |
| 6.050 | 0.32 | 7.017 | 0.01 | 7.98 | 0.01 | 8.950 | 0.01 | 9.917 | 0 | 10.883 | 0 |
| 6.067 | 0.35 | 7.033 | 0.01 | 8.00 | 0.01 | 8.967 | 0.01 | 9.933 | 0 | 10.900 | 0 |
| 6.083 | 0.33 | 7.050 | 0 | 8.02 | 0.01 | 8.983 | 0.01 | 9.950 | 0.01 | 10.917 | 0.01 |
| 6.100 | 0.32 | 7.067 | 0.01 | 8.03 | 0.01 | 9.000 | 0.01 | 9.967 | 0.01 | 10.933 | 0 |
| 6.117 | 0.07 | 7.083 | 0.01 | 8.05 | 0.01 | 9.017 | 0.01 | 9.983 | 0.01 | 10.950 | 0 |
| 6.133 | 0.06 | 7.100 | 0 | 8.07 | 0 | 9.033 | 0.01 | 10.000 | 0.01 | 10.967 | 0.01 |
| 6.150 | 0.06 | 7.117 | 0 | 8.08 | 0.01 | 9.050 | 0.01 | 10.017 | 0.01 | 10.983 | 0 |
| 6.167 | 0.08 | 7.133 | 0 | 8.10 | 0 | 9.067 | 0.01 | 10.033 | 0.01 | 11.000 | 0.01 |
| 6.183 | 0.06 | 7.150 | 0 | 8.12 | 0.01 | 9.083 | 0.01 | 10.050 | 0.01 | 11.017 | 0 |
| 6.200 | 0.05 | 7.167 | 0.01 | 8.13 | 0.01 | 9.100 | 0.01 | 10.067 | 0.01 | 11.033 | 0 |
| 6.217 | 0.06 | 7.183 | 0.01 | 8.15 | 0 | 9.117 | 0.01 | 10.083 | 0.01 | 11.050 | 0.01 |
| 6.233 | 0.05 | 7.200 | 0 | 8.17 | 0.01 | 9.133 | 0.01 | 10.100 | 0.01 | 11.067 | 0.01 |
| 6.250 | 0.05 | 7.217 | 0.01 | 8.18 | 0.01 | 9.150 | 0.01 | 10.117 | 0.01 | 11.083 | 0.01 |
| 6.267 | 0.05 | 7.233 | 0 | 8.20 | 0 | 9.167 | 0 | 10.133 | 0 | 11.100 | 0.01 |
| 6.283 | 0.04 | 7.250 | 0 | 8.22 | 0 | 9.183 | 0.01 | 10.150 | 0.01 | 11.117 | 0.01 |
| 6.300 | 0.05 | 7.267 | 0.01 | 8.23 | 0 | 9.200 | 0 | 10.167 | 0.01 | 11.133 | 0.01 |
| 6.317 | 0.04 | 7.283 | 0.01 | 8.25 | 0 | 9.217 | 0.01 | 10.183 | 0.01 | 11.150 | 0.01 |
| 6.333 | 0.04 | 7.300 | 0 | 8.27 | 0.01 | 9.233 | 0.01 | 10.200 | 0 | 11.167 | 0.01 |
| 6.350 | 0.05 | 7.317 | 0 | 8.28 | 0.01 | 9.250 | 0 | 10.217 | 0 | 11.183 | 0.01 |
| 6.367 | 0.05 | 7.333 | 0 | 8.30 | 0 | 9.267 | 0.01 | 10.233 | 0.01 | 11.200 | 0.01 |
| 6.383 | 0.05 | 7.350 | 0 | 8.32 | 0.01 | 9.283 | 0.01 | 10.250 | 0.01 | 11.217 | 0.01 |
| 6.400 | 0.04 | 7.367 | 0 | 8.33 | 0 | 9.300 | 0 | 10.267 | 0.01 | 11.233 | 0.01 |
| 6.417 | 0.05 | 7.383 | 0.01 | 8.35 | 0 | 9.317 | 0 | 10.283 | 0.01 | 11.250 | 0.01 |
| 6.433 | 0.04 | 7.400 | 0.01 | 8.37 | 0.01 | 9.333 | 0 | 10.300 | 0.01 | 11.267 | 0.01 |
| 6.450 | 0.04 | 7.417 | 0.01 | 8.38 | 0.01 | 9.350 | 0 | 10.317 | 0 | 11.283 | 0.01 |
| 6.467 | 0.04 | 7.433 | 0.01 | 8.40 | 0 | 9.367 | 0.01 | 10.333 | 0.01 | 11.300 | 0.01 |
| 6.483 | 0.04 | 7.450 | 0 | 8.42 | 0 | 9.383 | 0.01 | 10.350 | 0 | 11.317 | 0.01 |
| 6.500 | 0.04 | 7.467 | 0 | 8.43 | 0 | 9.400 | 0 | 10.367 | 0.01 | 11.333 | 0.01 |
| 6.517 | 0.04 | 7.483 | 0 | 8.45 | 0 | 9.417 | 0.01 | 10.383 | 0.01 | 11.350 | 0 |
| 6.533 | 0.04 | 7.500 | 0 | 8.47 | 0 | 9.433 | 0 | 10.400 | 0.01 | 11.367 | 0.01 |

| Validation Carbon Cycle Evolution Oxygen | | | |
|---|-----------|----------|-----------|
| Sim | | | |
| Time (d) | DO (mg/L) | Time (d) | DO (mg/L) |
| 16 | 0.00 | 16.54 | 0 |
| 16.01 | 0.37 | 16.55 | 0 |
| 16.02 | 0.37 | 16.56 | 0 |
| 16.03 | 0.37 | 16.57 | 0 |
| 16.04 | 0.38 | 16.58 | 0 |
| 16.05 | 0.38 | 16.59 | 0 |
| 16.06 | 0.38 | 16.6 | 0 |
| 16.07 | 0.39 | 16.61 | 0 |
| 16.08 | 0.39 | 16.62 | 0 |
| 16.09 | 0.39 | 16.63 | 0 |
| 16.1 | 0.39 | 16.64 | 0 |
| 16.11 | 0.40 | 16.65 | 0 |
| 16.12 | 0.40 | 16.66 | 0 |
| 16.13 | 0.40 | 16.67 | 0 |
| 16.14 | 0.40 | 16.68 | 0 |
| 16.15 | 0.41 | 16.69 | 0 |
| 16.16 | 0.41 | 16.7 | 0 |
| 16.17 | 0.41 | 16.71 | 0 |
| 16.18 | 0.42 | 16.72 | 0 |
| 16.19 | 0.42 | 16.73 | 0 |
| 16.2 | 0.42 | 16.74 | 0 |
| 16.21 | 0.43 | 16.75 | 0 |
| 16.22 | 0.44 | 16.76 | 0 |
| 16.23 | 0.45 | 16.77 | 0 |
| 16.24 | 0.48 | 16.78 | 0 |
| 16.25 | 0.55 | 16.79 | 0 |
| 16.26 | 0.00 | 16.8 | 0 |
| 16.27 | 0.00 | 16.81 | 0 |
| 16.28 | 0.00 | 16.82 | 0 |
| 16.29 | 0.00 | 16.83 | 0 |
| 16.3 | 0.00 | 16.84 | 0 |
| 16.31 | 0.00 | 16.85 | 0 |
| 16.32 | 0.00 | 16.86 | 0 |
| 16.33 | 0.00 | 16.87 | 0 |
| 16.34 | 0.00 | 16.88 | 0 |
| 16.35 | 0.00 | 16.89 | 0 |
| 16.36 | 0.00 | 16.9 | 0 |
| 16.37 | 0.00 | 16.91 | 0 |
| 16.38 | 0.00 | 16.92 | 0 |
| 16.39 | 0.00 | 16.93 | 0 |
| 16.4 | 0.00 | 16.94 | 0 |
| 16.41 | 0.00 | 16.95 | 0 |
| 16.42 | 0.00 | 16.96 | 0 |
| 16.43 | 0.00 | 16.97 | 0 |
| 16.44 | 0.00 | 16.98 | 0 |
| 16.45 | 0.00 | 16.99 | 0 |
| 16.46 | 0.00 | | |
| 16.47 | 0.00 | | |
| 16.48 | 0.00 | | |
| 16.49 | 0.00 | | |
| 16.5 | 0.00 | | |
| 16.51 | 0.00 | | |
| 16.52 | 0.00 | | |

| Calibration Carbon Longterm Evolution Beginning of Cycle Belgium | | | | | | | |
|--|----------|----------|----------|------|-------|-------|------------------|
| | Sim | | | Exp | | | |
| Time (d) | S_NH | S_NO2 | S_NO3 | S_NH | S_NO2 | S_NO3 | NO2 accumulation |
| 2.25 | 64.18313 | 0.918289 | 26.90478 | | | | |
| 3.25 | 91.97787 | 0.457241 | 28.37634 | | | | |
| 4.25 | 91.97573 | 0.813554 | 28.32712 | | | | |
| 5.25 | 89.97881 | 1.168936 | 27.46521 | | | | |
| 6.25 | 88.07654 | 1.478252 | 26.62548 | | | | |
| 7.25 | 86.86559 | 1.774722 | 25.87167 | | | | |
| 8.25 | 85.5334 | 2.094399 | 25.30421 | 92 | 1 | 31 | 0.659 |
| 9.25 | 83.7179 | 2.355022 | 24.8332 | | | | |
| 10.25 | 82.30838 | 2.701208 | 24.46879 | | | | |
| 11.25 | 80.699 | 3.002501 | 24.16634 | | | | |
| 12.25 | 79.22226 | 3.285332 | 23.93673 | | | | |
| 13.25 | 78.38313 | 3.524152 | 23.79523 | | | | |
| 14.25 | 76.98936 | 3.638836 | 23.66356 | | | | |
| 15.25 | 76.08388 | 3.903838 | 23.68081 | 77.8 | 4.4 | 23 | 0.797 |
| 16.25 | 74.89367 | 4.106669 | 23.73191 | | | | |
| 17.25 | 73.87473 | 4.294823 | 23.8019 | | | | |
| 18.25 | 72.95707 | 4.459894 | 23.87392 | | | | |
| 19.25 | 72.12855 | 4.636869 | 23.9686 | | | | |
| 20.25 | 72.19317 | 4.772886 | 24.04849 | | | | |
| 21.25 | 71.1966 | 4.882167 | 24.12105 | | | | |
| 22.25 | 70.5501 | 5.029612 | 24.21666 | 69.2 | 2.99 | 20 | 0.87 |
| 23.25 | 70.01782 | 5.166226 | 24.30917 | | | | 0.78 |
| 24.25 | 69.55828 | 5.290399 | 24.39562 | | | | |
| 25.25 | 69.14961 | 5.432154 | 24.49598 | | | | |
| 26.25 | 68.78221 | 5.556749 | 24.58412 | | | | |
| 27.25 | 68.44184 | 5.677527 | 24.66888 | | | | |
| 28.25 | 69.1946 | 5.573802 | 24.65733 | | | | |
| 29.25 | 68.93681 | 5.733477 | 24.72893 | | | | |
| 0 | 68.36838 | 5.855674 | 24.8082 | | | | |
| Calibration Carbon Longterm Evolution End of Cycle Belgium | | | | | | | |
| | Sim | | | Exp | | | |
| Time (d) | S_NH | S_NO2 | S_NO3 | S_NH | S_NO2 | S_NO3 | |
| 0.75 | 79.11257 | 0.526872 | 31.46876 | | | | |
| 1.75 | 79.6727 | 3.001516 | 31.31986 | | | | |
| 2.75 | 74.57487 | 7.031028 | 27.85118 | | | | |
| 3.75 | 69.45003 | 10.9542 | 24.25267 | | | | |
| 4.75 | 66.25301 | 13.81242 | 20.67934 | 0.1 | 0.23 | | |
| 5.75 | 62.85082 | 16.70517 | 17.19449 | | | | |
| 6.75 | 57.84525 | 20.35481 | 15.28711 | | | | |
| 7.75 | 54.28658 | 23.18471 | 15.02622 | | | | |
| 8.75 | 50.07456 | 25.96611 | 14.76451 | | | | |
| 9.75 | 46.18553 | 28.62567 | 14.64032 | | | | |
| 10.75 | 44.08449 | 29.81963 | 14.58512 | 0.05 | 0.12 | | |
| 11.75 | 39.92188 | 32.94516 | 14.52989 | | | | |
| 12.75 | 37.69975 | 34.69619 | 14.47462 | | | | |
| 13.75 | 34.5444 | 36.32116 | 14.41931 | | | | |
| 14.75 | 31.83739 | 37.88699 | 14.36397 | | | | |
| 15.75 | 29.42768 | 39.25422 | 14.3086 | | | | |
| 16.75 | 27.29444 | 40.42897 | 14.25319 | 0.23 | 0.12 | | |
| 17.75 | 27.81312 | 39.5233 | 14.19774 | | | | |
| 18.75 | 24.9693 | 41.80119 | 14.14226 | | | | |
| 19.75 | 23.39109 | 42.53193 | 14.08675 | | | | |

| Calibration Carbon Long term Evolution End of Denitrification Belgium | | | | | | | | | |
|---|------|-------|-------|------|-------|-------|-----|-----|-----|
| Time (d) | Sim | | | Exp | | | ARD | | |
| | S_NH | S_NO2 | S_NO3 | S_NH | S_NO2 | S_NO3 | | | |
| 0.34 | 69.9 | 0.3 | 15.3 | | | | | | |
| 1.34 | 81.0 | 0.3 | 15.4 | | | | | | |
| 2.34 | 77.8 | 0.2 | 14.1 | | | | | | |
| 3.34 | 73.1 | 0.2 | 11.9 | | | | | | |
| 4.34 | 69.5 | 0.2 | 9.8 | | | | | | |
| 5.34 | 66.6 | 0.2 | 8.2 | | | | | | |
| 6.34 | 62.8 | 0.1 | 6.8 | 60 | 0.48 | 4.4 | 0.0 | 0.7 | 0.5 |
| 7.34 | 59.8 | 0.1 | 5.6 | | | | | | |
| 8.34 | 55.6 | 0.1 | 4.5 | | | | | | |
| 9.34 | 52.1 | 0.1 | 3.6 | | | | | | |
| 10.34 | 48.7 | 0.1 | 2.8 | | | | | | |
| 11.34 | 46.5 | 0.1 | 2.2 | | | | | | |
| 12.34 | 44.8 | 0.1 | 1.8 | | | | | | |
| 13.34 | 41.4 | 0.1 | 1.4 | 42.4 | 0.48 | 4.4 | 0.0 | 0.7 | 0.7 |
| 14.34 | 38.8 | 0.1 | 1.1 | | | | | | |
| 15.34 | 36.5 | 0.2 | 0.9 | | | | | | |
| 16.34 | 34.4 | 0.2 | 0.8 | | | | | | |
| 17.34 | 32.6 | 0.2 | 0.8 | | | | | | |
| 18.34 | 32.3 | 0.2 | 0.7 | | | | | | |
| 19.34 | 30.6 | 0.2 | 0.7 | | | | | | |
| 20.34 | 29.3 | 0.2 | 0.8 | 36 | 0.1 | 0.1 | 0.2 | 0.7 | 6.7 |
| 21.34 | 28.2 | 0.2 | 0.8 | | | | | | |
| 22.34 | 27.3 | 0.2 | 0.9 | | | | | | |
| 23.34 | 26.5 | 0.2 | 0.9 | | | | | | |
| 24.34 | 25.8 | 0.2 | 1.0 | | | | | | |
| 25.34 | 25.1 | 0.2 | 1.0 | | | | | | |
| 26.34 | 28.2 | 0.2 | 1.1 | | | | | | |
| 27.34 | 26.1 | 0.2 | 1.1 | | | | | | |
| 28.34 | 25.1 | 0.2 | 1.1 | | | | | | |
| 29.34 | 25.8 | 0.2 | 1.1 | | | | | | |

| Calibration Carbon Long term Evolution Carbon addition Bel | | | |
|--|----------|--------|----------|
| Time (d) | Sim | Exp | ARD |
| | C(S_S) | C(S_S) | |
| 1.28 | 281.0596 | | |
| 2.28 | 361.925 | | |
| 3.28 | 384.9991 | | |
| 4.28 | 391.5822 | | |
| 5.28 | 393.4604 | | |
| 6.28 | 393.9962 | | |
| 7.28 | 394.1491 | 164 | 1.403348 |
| 8.28 | 394.1927 | | |
| 9.28 | 394.2051 | | |
| 10.28 | 394.2087 | | |
| 11.28 | 394.2097 | | |
| 12.28 | 394.21 | | |
| 13.28 | 394.2101 | | |
| 14.28 | 394.2101 | 207 | 0.904397 |
| 15.28 | 394.2101 | | |
| 16.28 | 394.2101 | | |
| 17.28 | 394.2101 | | |
| 18.28 | 394.2101 | | |

| Calibration Carbon Cycle Evolution Nutrient Belgium | | | | | | | | | | |
|---|----------|------|-------|-------|------|-------|-------|-------|--------|--------|
| Time (h) | Time (d) | Sim | | | Exp | | | ARD | | |
| | | S_NH | S_NO2 | S_NO3 | S_NH | S_NO2 | S_NO3 | S_NH | S_NO2 | S_NO3 |
| 0 | 20 | 74.8 | 2.0 | 23.8 | 69.2 | 2.99 | 20 | 0.081 | 0.322 | 0.1911 |
| 0.24 | 20.01 | 72.7 | 3.5 | 24.0 | | | | | | |
| 0.48 | 20.02 | 70.6 | 5.0 | 24.2 | | | | | | |
| 0.72 | 20.03 | 68.4 | 6.5 | 24.5 | | | | | | |
| 0.96 | 20.04 | 66.3 | 8.1 | 24.7 | | | | | | |
| 1.2 | 20.05 | 64.2 | 9.6 | 25.0 | | | | | | |
| 1.44 | 20.06 | 62.0 | 11.2 | 25.3 | | | | | | |
| 1.68 | 20.07 | 59.9 | 12.8 | 25.7 | | | | | | |
| 1.92 | 20.08 | 57.7 | 14.5 | 26.0 | 55 | 12 | 20 | 0.049 | 0.2059 | 0.3001 |
| 2.16 | 20.09 | 55.6 | 16.1 | 26.4 | | | | | | |
| 2.4 | 20.1 | 53.4 | 17.8 | 26.7 | | | | | | |
| 2.64 | 20.11 | 51.2 | 19.5 | 27.1 | | | | | | |
| 2.88 | 20.12 | 49.1 | 21.2 | 27.5 | | | | | | |
| 3.12 | 20.13 | 46.9 | 22.9 | 27.9 | | | | | | |
| 3.36 | 20.14 | 44.7 | 24.7 | 28.3 | | | | | | |
| 3.6 | 20.15 | 42.5 | 26.4 | 28.7 | | | | | | |
| 3.84 | 20.16 | 40.3 | 28.2 | 29.1 | 42 | 26 | 23 | 0.04 | 0.0857 | 0.2666 |
| 4.08 | 20.17 | 38.1 | 30.0 | 29.6 | | | | | | |
| 4.32 | 20.18 | 35.9 | 31.8 | 30.0 | | | | | | |
| 4.56 | 20.19 | 33.7 | 33.6 | 30.5 | | | | | | |
| 4.8 | 20.2 | 31.5 | 35.5 | 30.9 | | | | | | |
| 5.04 | 20.21 | 29.3 | 37.3 | 31.4 | | | | | | |
| 5.28 | 20.22 | 27.1 | 39.1 | 31.8 | | | | | | |
| 5.52 | 20.23 | 24.9 | 41.0 | 32.3 | | | | | | |
| 5.76 | 20.24 | 22.7 | 42.8 | 32.8 | 30 | 37.4 | 25 | 0.242 | 0.1457 | 0.3123 |
| 6 | 20.25 | 22.6 | 42.9 | 32.2 | | | | | | |
| 6.24 | 20.26 | 26.6 | 24.2 | 20.1 | | | | | | |
| 6.48 | 20.27 | 30.5 | 5.0 | 7.8 | | | | | | |
| 6.72 | 20.28 | 31.2 | 0 | 3.9 | | | | | | |
| 6.96 | 20.29 | 30.7 | 0 | 3.1 | | | | | | |
| 7.2 | 20.3 | 30.2 | 0 | 2.4 | | | | | | |
| 7.44 | 20.31 | 29.8 | 0 | 1.7 | | | | | | |
| 7.68 | 20.32 | 11.3 | 0 | 1.0 | | | | | | |
| 7.92 | 20.33 | 10.6 | 0 | 0.8 | 36 | 0.1 | 0.1 | 0.705 | 2.6923 | 6.7229 |
| 8.16 | 20.34 | 10.3 | 0 | 0.7 | | | | | | |
| 8.4 | 20.35 | 10.1 | 0 | 0.6 | | | | | | |
| 8.64 | 20.36 | 9.8 | 0 | 0.5 | | | | | | |
| 8.88 | 20.37 | 9.6 | 0 | 0.4 | | | | | | |
| 9.12 | 20.38 | 9.5 | 0 | 0.3 | | | | | | |
| 9.36 | 20.39 | 9.4 | 0 | 0.2 | | | | | | |
| 9.6 | 20.4 | 9.4 | 0 | 0.2 | | | | | | |
| 9.84 | 20.41 | 9.4 | 0 | 0.1 | | | | | | |
| 10.08 | 20.42 | 9.4 | 0 | 0.1 | | | | | | |
| 10.32 | 20.43 | 9.4 | 0 | 0.1 | | | | | | |
| 10.56 | 20.44 | 9.4 | 0 | 0.1 | | | | | | |
| 10.8 | 20.45 | 9.4 | 0 | 0.1 | | | | | | |
| 11.04 | 20.46 | 9.4 | 0 | 0.1 | | | | | | |
| 11.28 | 20.47 | 9.4 | 0 | 0.0 | | | | | | |
| 11.52 | 20.48 | 9.4 | 0 | 0.0 | | | | | | |
| 11.76 | 20.49 | 9.4 | 0 | 0.0 | 8 | 0.1 | 0.3 | 0.174 | 1.284 | 0.911 |
| 12 | 20.5 | 9.4 | 2.1 | 23.8 | | | | | | |
| 12.24 | 20.51 | 9.4 | 3.6 | 24.0 | | | | 0.215 | 0.7893 | 1.4507 |
| 12.48 | 20.52 | 9.4 | 5.1 | 24.3 | | | | | | |
| 12.72 | 20.53 | 9.4 | 6.6 | 24.5 | | | | | | |
| 12.96 | 20.54 | 9.4 | 8.2 | 24.8 | | | | | | |

| Time (h) | Time (d) | Sim | | | Exp | | | ARD | | |
|----------|----------|------|-------|-------|------|-------|-------|------|-------|-------|
| | | S_NH | S_NO2 | S_NO3 | S_NH | S_NO2 | S_NO3 | S_NH | S_NO2 | S_NO3 |
| 14.16 | 20.59 | 9.4 | 16.3 | 26.5 | | | | | | |
| 14.4 | 20.6 | 9.4 | 18.0 | 26.9 | | | | | | |
| 14.64 | 20.61 | 9.4 | 19.7 | 27.2 | | | | | | |
| 14.88 | 20.62 | 9.4 | 21.4 | 27.6 | | | | | | |
| 15.12 | 20.63 | 9.4 | 23.1 | 28.0 | | | | | | |
| 15.36 | 20.64 | 9.4 | 24.9 | 28.5 | | | | | | |
| 15.6 | 20.65 | 9.4 | 26.7 | 28.9 | | | | | | |
| 15.84 | 20.66 | 9.4 | 28.5 | 29.3 | | | | | | |
| 16.08 | 20.67 | 9.4 | 30.3 | 29.8 | | | | | | |
| 16.32 | 20.68 | 9.4 | 32.1 | 30.2 | | | | | | |
| 16.56 | 20.69 | 9.4 | 33.9 | 30.7 | | | | | | |
| 16.8 | 20.7 | 9.4 | 35.7 | 31.2 | | | | | | |
| 17.04 | 20.71 | 9.4 | 37.6 | 31.6 | | | | | | |
| 17.28 | 20.72 | 9.4 | 39.4 | 32.1 | | | | | | |
| 17.52 | 20.73 | 9.4 | 41.3 | 32.6 | | | | | | |
| 17.76 | 20.74 | 9.4 | 43.1 | 33.1 | | | | | | |
| 18 | 20.75 | 9.4 | 43.2 | 32.4 | | | | | | |
| 18.24 | 20.76 | 9.4 | 24.4 | 20.3 | | | | | | |
| 18.48 | 20.77 | 9.4 | 5.0 | 7.9 | | | | | | |
| 18.72 | 20.78 | 9.4 | 0 | 3.9 | | | | | | |
| 18.96 | 20.79 | 9.4 | 0 | 3.1 | | | | | | |
| 19.2 | 20.8 | 9.4 | 0 | 2.4 | | | | | | |
| 19.44 | 20.81 | 9.4 | 0 | 1.7 | | | | | | |
| 19.68 | 20.82 | 9.4 | 0 | 1.1 | | | | | | |
| 19.92 | 20.83 | 9.4 | 0 | 0.8 | | | | | | |
| 20.16 | 20.84 | 9.4 | 0 | 0.7 | | | | | | |
| 20.4 | 20.85 | 9.4 | 0 | 0.6 | | | | | | |
| 20.64 | 20.86 | 9.4 | 0 | 0.5 | | | | | | |
| 20.88 | 20.87 | 9.4 | 0 | 0.4 | | | | | | |
| 21.12 | 20.88 | 9.4 | 0 | 0.3 | | | | | | |
| 21.36 | 20.89 | 9.4 | 0 | 0.2 | | | | | | |
| 21.6 | 20.9 | 9.4 | 0 | 0.2 | | | | | | |
| 21.84 | 20.91 | 9.4 | 0 | 0.1 | | | | | | |
| 22.08 | 20.92 | 9.4 | 0 | 0.1 | | | | | | |
| 22.32 | 20.93 | 9.4 | 0 | 0.1 | | | | | | |
| 22.56 | 20.94 | 9.4 | 0 | 0.1 | | | | | | |
| 22.8 | 20.95 | 9.4 | 0 | 0.1 | | | | | | |
| 23.04 | 20.96 | 9.4 | 0 | 0.1 | | | | | | |
| 23.28 | 20.97 | 9.4 | 0 | 0.0 | | | | | | |
| 23.52 | 20.98 | 9.4 | 0 | 0.0 | | | | | | |
| 23.76 | 20.99 | 9.4 | 0 | 0.0 | | | | | | |
| 24 | 21 | 9.4 | 2.1 | | | | | | | |

| Calibration Carbon Cycle Evolution Oxygen Belgium | | | | | | | | | | | | | |
|---|-----------|----------|-----------|----------|-----------|----------|-----------|----------|-----------|----------|-----------|----------|-----------|
| Exp | | | | | | | | | | | | | |
| Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) |
| 0 | 0 | 0.92 | 1.06 | 1.82 | 1.09 | 2.72 | 1.1 | 3.62 | 0.92 | 4.52 | 1.04 | 5.42 | 1 |
| 0.02 | 0.02 | 0.93 | 0.91 | 1.83 | 1.06 | 2.73 | 1.09 | 3.63 | 1.1 | 4.53 | 1.01 | 5.43 | 1.13 |
| 0.03 | 2.48 | 0.95 | 0.93 | 1.85 | 0.88 | 2.75 | 0.96 | 3.65 | 0.96 | 4.55 | 1.02 | 5.45 | 1.08 |
| 0.05 | 2.23 | 0.97 | 1.17 | 1.87 | 0.92 | 2.77 | 1.11 | 3.67 | 0.96 | 4.57 | 1.05 | 5.47 | 0.97 |
| 0.07 | 1.76 | 0.98 | 1.1 | 1.88 | 1.03 | 2.78 | 1 | 3.68 | 1.02 | 4.58 | 1.1 | 5.48 | 1.03 |
| 0.08 | 1.71 | 1 | 0.98 | 1.9 | 1.05 | 2.8 | 0.93 | 3.7 | 0.95 | 4.6 | 1.02 | 5.5 | 1.18 |
| 0.1 | 1.54 | 1.02 | 1.05 | 1.92 | 1.1 | 2.82 | 0.81 | 3.72 | 0.91 | 4.62 | 0.99 | 5.52 | 1.13 |
| 0.12 | 1.28 | 1.03 | 0.96 | 1.93 | 1 | 2.83 | 1.16 | 3.73 | 1.11 | 4.63 | 0.96 | 5.53 | 0.83 |
| 0.13 | 0.87 | 1.05 | 1 | 1.95 | 0.95 | 2.85 | 1.15 | 3.75 | 0.89 | 4.65 | 0.87 | 5.55 | 1.23 |
| 0.15 | 1.48 | 1.07 | 1.09 | 1.97 | 0.85 | 2.87 | 0.85 | 3.77 | 1.23 | 4.67 | 1.03 | 5.57 | 1.18 |
| 0.17 | 1.51 | 1.08 | 1.03 | 1.98 | 1.04 | 2.88 | 1.16 | 3.78 | 1.09 | 4.68 | 0.97 | 5.58 | 1.02 |
| 0.18 | 1.2 | 1.1 | 0.94 | 2 | 0.97 | 2.9 | 1.02 | 3.8 | 1.06 | 4.7 | 0.96 | 5.6 | 0.97 |
| 0.2 | 1 | 1.12 | 1.09 | 2.02 | 0.98 | 2.92 | 0.93 | 3.82 | 0.61 | 4.72 | 0.98 | 5.62 | 0.91 |
| 0.22 | 1.27 | 1.13 | 0.94 | 2.03 | 0.99 | 2.93 | 0.99 | 3.83 | 1.12 | 4.73 | 1.04 | 5.63 | 1.05 |
| 0.23 | 1.21 | 1.15 | 0.96 | 2.05 | 1.03 | 2.95 | 1 | 3.85 | 1.07 | 4.75 | 1.06 | 5.65 | 1.03 |
| 0.25 | 0.9 | 1.17 | 1.04 | 2.07 | 0.98 | 2.97 | 0.94 | 3.87 | 1.13 | 4.77 | 1.07 | 5.67 | 0.95 |
| 0.27 | 1.38 | 1.18 | 1.08 | 2.08 | 0.97 | 2.98 | 1 | 3.88 | 0.89 | 4.78 | 1.07 | 5.68 | 0.93 |
| 0.28 | 1.01 | 1.2 | 0.95 | 2.1 | 0.99 | 3 | 0.98 | 3.9 | 0.96 | 4.8 | 0.78 | 5.7 | 1.12 |
| 0.3 | 0.27 | 1.22 | 0.91 | 2.12 | 0.86 | 3.02 | 1.01 | 3.92 | 1.12 | 4.82 | 1.2 | 5.72 | 1.04 |
| 0.32 | 1.11 | 1.23 | 1.11 | 2.13 | 1.23 | 3.03 | 1.04 | 3.93 | 1.1 | 4.83 | 1.12 | 5.73 | 0.94 |
| 0.33 | 1.07 | 1.25 | 0.99 | 2.15 | 1.11 | 3.05 | 1.02 | 3.95 | 1.08 | 4.85 | 1.06 | 5.75 | 0.91 |
| 0.35 | 0.55 | 1.27 | 1.02 | 2.17 | 0.88 | 3.07 | 1 | 3.97 | 0.89 | 4.87 | 0.82 | 5.77 | 0.84 |
| 0.37 | 1.14 | 1.28 | 1.04 | 2.18 | 1.28 | 3.08 | 1.08 | 3.98 | 0.98 | 4.88 | 1.12 | 5.78 | 1.15 |
| 0.38 | 1.16 | 1.3 | 0.83 | 2.2 | 1.14 | 3.1 | 1.01 | 4 | 1.08 | 4.9 | 1.17 | 5.8 | 1.02 |
| 0.4 | 1.09 | 1.32 | 1.02 | 2.22 | 0.83 | 3.12 | 0.99 | 4.02 | 1.03 | 4.92 | 1.08 | 5.82 | 0.88 |
| 0.42 | 0.72 | 1.33 | 1.1 | 2.23 | 1.14 | 3.13 | 0.99 | 4.03 | 0.98 | 4.93 | 1 | 5.83 | 1.05 |
| 0.43 | 1.17 | 1.35 | 0.96 | 2.25 | 0.94 | 3.15 | 0.89 | 4.05 | 0.66 | 4.95 | 0.94 | 5.85 | 0.97 |
| 0.45 | 0.86 | 1.37 | 1.08 | 2.27 | 1.1 | 3.17 | 1.17 | 4.07 | 1.07 | 4.97 | 1.14 | 5.87 | 1.02 |
| 0.47 | 1.12 | 1.38 | 0.96 | 2.28 | 1.12 | 3.18 | 1.03 | 4.08 | 1.04 | 4.98 | 1 | 5.88 | 0.99 |
| 0.48 | 1.05 | 1.4 | 0.87 | 2.3 | 0.86 | 3.2 | 1.07 | 4.1 | 0.97 | 5 | 0.92 | 5.9 | 1 |
| 0.5 | 0.91 | 1.42 | 1.06 | 2.32 | 1.15 | 3.22 | 1.04 | 4.12 | 1.02 | 5.02 | 0.73 | 5.92 | 0.99 |
| 0.52 | 0.91 | 1.43 | 1.01 | 2.33 | 1 | 3.23 | 1.03 | 4.13 | 1.13 | 5.03 | 1.14 | 5.93 | 1.06 |
| 0.53 | 1.21 | 1.45 | 0.98 | 2.35 | 0.95 | 3.25 | 0.88 | 4.15 | 1.06 | 5.05 | 1.07 | 5.95 | 0.98 |
| 0.55 | 0.97 | 1.47 | 1.06 | 2.37 | 1.03 | 3.27 | 1.1 | 4.17 | 0.91 | 5.07 | 1 | 5.97 | 1.03 |
| 0.57 | 0.94 | 1.48 | 1 | 2.38 | 0.99 | 3.28 | 1.04 | 4.18 | 1.13 | 5.08 | 1 | 5.98 | 1.08 |
| 0.58 | 0.99 | 1.5 | 1.03 | 2.4 | 0.96 | 3.3 | 1.03 | 4.2 | 1 | 5.1 | 1.04 | 6 | 1.01 |
| 0.6 | 1.04 | 1.52 | 0.96 | 2.42 | 1.13 | 3.32 | 0.82 | 4.22 | 0.97 | 5.12 | 0.99 | 6.02 | 0.89 |
| 0.62 | 1.02 | 1.53 | 0.97 | 2.43 | 1.03 | 3.33 | 1.15 | 4.23 | 0.98 | 5.13 | 1.12 | 6.03 | 1.23 |
| 0.63 | 1.07 | 1.55 | 1.09 | 2.45 | 0.86 | 3.35 | 1.08 | 4.25 | 1.24 | 5.15 | 1.05 | 6.05 | 1.11 |
| 0.65 | 0.97 | 1.57 | 0.98 | 2.47 | 1.21 | 3.37 | 0.87 | 4.27 | 1.06 | 5.17 | 1.04 | 6.07 | 0.88 |
| 0.67 | 0.89 | 1.58 | 1.08 | 2.48 | 1 | 3.38 | 1.04 | 4.28 | 1.05 | 5.18 | 0.8 | 6.08 | 0.7 |
| 0.68 | 1.13 | 1.6 | 0.98 | 2.5 | 0.97 | 3.4 | 1.06 | 4.3 | 1.02 | 5.2 | 1.1 | 6.1 | 0.51 |
| 0.7 | 0.95 | 1.62 | 1.01 | 2.52 | 0.95 | 3.42 | 0.96 | 4.32 | 0.94 | 5.22 | 1.04 | 6.12 | 0.42 |
| 0.72 | 1.03 | 1.63 | 0.94 | 2.53 | 1.09 | 3.43 | 1.07 | 4.33 | 0.73 | 5.23 | 1.05 | 6.13 | 0.31 |
| 0.73 | 0.94 | 1.65 | 0.99 | 2.55 | 0.97 | 3.45 | 0.98 | 4.35 | 1.18 | 5.25 | 0.75 | 6.15 | 0.19 |
| 0.75 | 1.01 | 1.67 | 1.02 | 2.57 | 0.59 | 3.47 | 0.95 | 4.37 | 1.1 | 5.27 | 1.03 | 6.17 | 0.12 |
| 0.77 | 0.96 | 1.68 | 1.06 | 2.58 | 1.3 | 3.48 | 0.99 | 4.38 | 0.94 | 5.28 | 1.21 | 6.18 | 0.02 |
| 0.78 | 1.01 | 1.7 | 1.07 | 2.6 | 1.17 | 3.5 | 0.96 | 4.4 | 1.13 | 5.3 | 1.07 | 6.2 | 0.1 |
| 0.8 | 1.01 | 1.72 | 0.99 | 2.62 | 0.93 | 3.52 | 1.01 | 4.42 | 1.1 | 5.32 | 1.02 | 6.22 | 0.01 |
| 0.82 | 0.96 | 1.73 | 1 | 2.63 | 1.21 | 3.53 | 0.98 | 4.43 | 1.01 | 5.33 | 0.86 | 6.23 | 0.01 |
| 0.83 | 0.99 | 1.75 | 0.94 | 2.65 | 1.1 | 3.55 | 1.02 | 4.45 | 0.98 | 5.35 | 1.04 | 6.25 | 0.07 |
| 0.85 | 0.96 | 1.77 | 0.94 | 2.67 | 0.9 | 3.57 | 0.99 | 4.47 | 0.73 | 5.37 | 1.15 | 6.27 | 0.05 |
| 0.87 | 1.05 | 1.78 | 1.02 | 2.68 | 1.09 | 3.58 | 0.98 | 4.48 | 1.1 | 5.38 | 1.08 | 6.28 | 0.02 |
| 0.88 | 1.06 | 1.8 | 1.01 | 2.7 | 0.91 | 3.6 | 0.99 | 4.5 | 1.06 | 5.4 | 0.91 | 6.3 | 0 |

| Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) |
|----------|-----------|----------|-----------|----------|-----------|----------|-----------|----------|-----------|----------|-----------|----------|-----------|
| 6.32 | 0.02 | 7.27 | 0.01 | 8.22 | 0.05 | 9.17 | 0.05 | 10.1 | 0.05 | 11.1 | 0.05 | | |
| 6.33 | 0.02 | 7.28 | 0.1 | 8.23 | 0.05 | 9.18 | 0.05 | 10.1 | 0.05 | 11.1 | 0.05 | | |
| 6.35 | 0.01 | 7.3 | 0.02 | 8.25 | 0.05 | 9.2 | 0.05 | 10.2 | 0.05 | 11.1 | 0.05 | | |
| 6.37 | 0.03 | 7.32 | 0.06 | 8.27 | 0.05 | 9.22 | 0.05 | 10.2 | 0.05 | 11.1 | 0.05 | | |
| 6.38 | 0.01 | 7.33 | 0.01 | 8.28 | 0.05 | 9.23 | 0.05 | 10.2 | 0.04 | 11.1 | 0.05 | | |
| 6.4 | 0.07 | 7.35 | 0.01 | 8.3 | 0.04 | 9.25 | 0.05 | 10.2 | 0.05 | 11.2 | 0.05 | | |
| 6.42 | 0.05 | 7.37 | 0 | 8.32 | 0.05 | 9.27 | 0.05 | 10.2 | 0.05 | 11.2 | 0.05 | | |
| 6.43 | 0.07 | 7.38 | 0 | 8.33 | 0.05 | 9.28 | 0.05 | 10.2 | 0.05 | 11.2 | 0.05 | | |
| 6.45 | 0.07 | 7.4 | 0.01 | 8.35 | 0.05 | 9.3 | 0.05 | 10.3 | 0.05 | 11.2 | 0.05 | | |
| 6.47 | 0 | 7.42 | 0.02 | 8.37 | 0.05 | 9.32 | 0.05 | 10.3 | 0.05 | 11.2 | 0.04 | | |
| 6.48 | 0.09 | 7.43 | 0.01 | 8.38 | 0.05 | 9.33 | 0.05 | 10.3 | 0.05 | 11.2 | 0.05 | | |
| 6.5 | 0.07 | 7.45 | 0.07 | 8.4 | 0.05 | 9.35 | 0.04 | 10.3 | 0.05 | 11.3 | 0.05 | | |
| 6.52 | 0 | 7.47 | 0 | 8.42 | 0.05 | 9.37 | 0.05 | 10.3 | 0.05 | 11.3 | 0.05 | | |
| 6.53 | 0.09 | 7.48 | 0.02 | 8.43 | 0.05 | 9.38 | 0.05 | 10.3 | 0.05 | 11.3 | 0.05 | | |
| 6.55 | 0.02 | 7.5 | 0.04 | 8.45 | 0.05 | 9.4 | 0.05 | 10.4 | 0.05 | 11.3 | 0.05 | | |
| 6.57 | 0.01 | 7.52 | 0 | 8.47 | 0.05 | 9.42 | 0.05 | 10.4 | 0.05 | 11.3 | 0.05 | | |
| 6.58 | 0.1 | 7.53 | 0.08 | 8.48 | 0.05 | 9.43 | 0.05 | 10.4 | 0.04 | 11.3 | 0.05 | | |
| 6.6 | 0.02 | 7.55 | 0.02 | 8.5 | 0.05 | 9.45 | 0.05 | 10.4 | 0.05 | 11.4 | 0.05 | | |
| 6.62 | 0.06 | 7.57 | 0.01 | 8.52 | 0.04 | 9.47 | 0.05 | 10.4 | 0.05 | 11.4 | 0.05 | | |
| 6.63 | 0.01 | 7.58 | 0.07 | 8.53 | 0.05 | 9.48 | 0.05 | 10.4 | 0.05 | 11.4 | 0.05 | | |
| 6.65 | 0.01 | 7.6 | 0 | 8.55 | 0.05 | 9.5 | 0.05 | 10.5 | 0.05 | 11.4 | 0.05 | | |
| 6.67 | 0 | 7.62 | 0.02 | 8.57 | 0.05 | 9.52 | 0.05 | 10.5 | 0.05 | 11.4 | 0.05 | | |
| 6.68 | 0 | 7.63 | 0.04 | 8.58 | 0.05 | 9.53 | 0.05 | 10.5 | 0.05 | 11.4 | 0.04 | | |
| 6.7 | 0.01 | 7.65 | 0 | 8.6 | 0.05 | 9.55 | 0.04 | 10.5 | 0.05 | 11.5 | 0.05 | | |
| 6.72 | 0.02 | 7.67 | 0.08 | 8.62 | 0.05 | 9.57 | 0.05 | 10.5 | 0.05 | 11.5 | 0.05 | | |
| 6.73 | 0.01 | 7.68 | 0.07 | 8.63 | 0.05 | 9.58 | 0.05 | 10.5 | 0.05 | 11.5 | 0.05 | | |
| 6.75 | 0.07 | 7.7 | 0 | 8.65 | 0.05 | 9.6 | 0.05 | 10.6 | 0.05 | 11.5 | 0.05 | | |
| 6.77 | 0 | 7.72 | 0.09 | 8.67 | 0.05 | 9.62 | 0.05 | 10.6 | 0.05 | 11.5 | 0.05 | | |
| 6.78 | 0.02 | 7.73 | 0.02 | 8.68 | 0.05 | 9.63 | 0.05 | 10.6 | 0.05 | 11.5 | 0.05 | | |
| 6.8 | 0.04 | 7.75 | 0.01 | 8.7 | 0.05 | 9.65 | 0.05 | 10.6 | 0.04 | 11.6 | 0.05 | | |
| 6.82 | 0 | 7.77 | 0.1 | 8.72 | 0.04 | 9.67 | 0.05 | 10.6 | 0.05 | 11.6 | 0.05 | | |
| 6.83 | 0.08 | 7.78 | 0.02 | 8.73 | 0.05 | 9.68 | 0.05 | 10.6 | 0.05 | 11.6 | 0.05 | | |
| 6.85 | 0.07 | 7.8 | 0.06 | 8.75 | 0.05 | 9.7 | 0.05 | 10.7 | 0.05 | 11.6 | 0.05 | | |
| 6.87 | 0 | 7.82 | 0.01 | 8.77 | 0.05 | 9.72 | 0.05 | 10.7 | 0.05 | 11.6 | 0.05 | | |
| 6.88 | 0.09 | 7.83 | 0.09 | 8.78 | 0.05 | 9.73 | 0.05 | 10.7 | 0.05 | 11.6 | 0.04 | | |
| 6.9 | 0.02 | 7.85 | 0.02 | 8.8 | 0.05 | 9.75 | 0.05 | 10.7 | 0.05 | 11.7 | 0.05 | | |
| 6.92 | 0.01 | 7.87 | 0.01 | 8.82 | 0.05 | 9.77 | 0.04 | 10.7 | 0.05 | 11.7 | 0.05 | | |
| 6.93 | 0.1 | 7.88 | 0.1 | 8.83 | 0.05 | 9.78 | 0.05 | 10.7 | 0.05 | 11.7 | 0.05 | | |
| 6.95 | 0.02 | 7.9 | 0.02 | 8.85 | 0.05 | 9.8 | 0.05 | 10.8 | 0.05 | 11.7 | 0.05 | | |
| 6.97 | 0.06 | 7.92 | 0.06 | 8.87 | 0.05 | 9.82 | 0.05 | 10.8 | 0.05 | 11.7 | 0.05 | | |
| 6.98 | 0.01 | 7.93 | 0.01 | 8.88 | 0.05 | 9.83 | 0.05 | 10.8 | 0.05 | 11.7 | 0.05 | | |
| 7 | 0.01 | 7.95 | 0.01 | 8.9 | 0.05 | 9.85 | 0.05 | 10.8 | 0.04 | 11.8 | 0.05 | | |
| 7.02 | 0 | 7.97 | 0 | 8.92 | 0.05 | 9.87 | 0.05 | 10.8 | 0.05 | 11.8 | 0.05 | | |
| 7.03 | 0 | 7.98 | 0 | 8.93 | 0.04 | 9.88 | 0.05 | 10.8 | 0.05 | 11.8 | 0.05 | | |
| 7.05 | 0.01 | 8 | 0.01 | 8.95 | 0.05 | 9.9 | 0.05 | 10.9 | 0.05 | 11.8 | 0.05 | | |
| 7.07 | 0.02 | 8.02 | 0.05 | 8.97 | 0.05 | 9.92 | 0.05 | 10.9 | 0.05 | 11.8 | 0.04 | | |
| 7.08 | 0.01 | 8.03 | 0.05 | 8.98 | 0.05 | 9.93 | 0.05 | 10.9 | 0.05 | 11.8 | 0.05 | | |
| 7.1 | 0.07 | 8.05 | 0.05 | 9 | 0.05 | 9.95 | 0.05 | 10.9 | 0.05 | 11.9 | 0.05 | | |
| 7.12 | 0 | 8.07 | 0.05 | 9.02 | 0.05 | 9.97 | 0.04 | 10.9 | 0.05 | 11.9 | 0.05 | | |
| 7.13 | 0.02 | 8.08 | 0.05 | 9.03 | 0.05 | 9.98 | 0.05 | 10.9 | 0.05 | 11.9 | 0.05 | | |
| 7.15 | 0.04 | 8.1 | 0.04 | 9.05 | 0.05 | 10 | 0.05 | 11 | 0.05 | 11.9 | 0.05 | | |
| 7.17 | 0 | 8.12 | 0.05 | 9.07 | 0.05 | 10 | 0.05 | 11 | 0.05 | 11.9 | 0.05 | | |
| 7.18 | 0.08 | 8.13 | 0.05 | 9.08 | 0.05 | 10 | 0.05 | 11 | 0.05 | 11.9 | 0.05 | | |
| 7.2 | 0.07 | 8.15 | 0.05 | 9.1 | 0.05 | 10.1 | 0.05 | 11 | 0.05 | 12 | 0.05 | | |
| 7.22 | 0 | 8.17 | 0.05 | 9.12 | 0.05 | 10.1 | 0.05 | 11 | 0.04 | 12 | 0.05 | | |
| 7.23 | 0.09 | 8.18 | 0.05 | 9.13 | 0.04 | 10.1 | 0.05 | 11 | 0.05 | 12 | 0.05 | | |

| Sim | |
|----------|-----------|
| Time (d) | DO (mg/L) |
| 20 | 1.179 |
| 20.01 | 1.225 |
| 20.02 | 1.264 |
| 20.03 | 1.304 |
| 20.04 | 1.343 |
| 20.05 | 1.382 |
| 20.06 | 1.42 |
| 20.07 | 1.458 |
| 20.08 | 1.494 |
| 20.09 | 1.529 |
| 20.1 | 1.564 |
| 20.11 | 1.597 |
| 20.12 | 1.629 |
| 20.13 | 1.66 |
| 20.14 | 1.69 |
| 20.15 | 1.72 |
| 20.16 | 1.748 |
| 20.17 | 1.775 |
| 20.18 | 1.802 |
| 20.19 | 1.827 |
| 20.2 | 1.853 |
| 20.21 | 1.877 |
| 20.22 | 1.901 |
| 20.23 | 1.926 |
| 20.24 | 1.95 |
| 20.25 | 0 |
| 20.26 | 0 |
| 20.27 | 0 |
| 20.28 | 0 |
| 20.29 | 0 |
| 20.3 | 0 |
| 20.31 | 0 |
| 20.32 | 0 |
| 20.33 | 0 |
| 20.34 | 0 |
| 20.35 | 0 |
| 20.36 | 0 |
| 20.37 | 0 |
| 20.38 | 0 |
| 20.39 | 0 |
| 20.4 | 0 |
| 20.41 | 0 |
| 20.42 | 0 |
| 20.43 | 0 |
| 20.44 | 0 |
| 20.45 | 0 |
| 20.46 | 0 |
| 20.47 | 0 |
| 20.48 | 0 |
| 20.49 | 0 |
| 20.5 | 0 |

| Validation Carbon Long term Evolution End of Nitrification Belgium | | | | | | | | | |
|--|--------|-------|-------|------|--------|-------|------|------|------|
| Time (d) | Sim | | | Exp | | | ARD | | |
| | S_NH | S_NO2 | S_NO3 | S_NH | S_NO2 | S_NO3 | | | |
| 0.25 | 67.6 | 6.3 | 13.0 | | | | | | |
| 1.25 | 188.5 | 4.3 | 0.1 | | | | | | |
| 2.25 | 200.7 | 6.7 | 0.2 | 195 | | | 0.03 | 0.03 | 0.03 |
| 3.25 | 199.5 | 8.8 | 0.3 | | | | | | |
| 4.25 | 194.5 | 12.1 | 0.9 | | | | | | |
| 5.25 | 191.4 | 12.9 | 1.2 | | | | | | |
| 6.25 | 187.8 | 14.2 | 1.7 | 175 | 10.351 | 0.343 | 0.07 | 0.37 | 4.00 |
| 7.25 | 193.0 | 9.1 | 0.7 | | | | | | |
| 8.25 | 115.4 | 13.8 | 1.9 | | | | | | |
| 9.25 | 102.9 | 14.8 | 2.5 | | | | | | |
| 10.25 | 98.8 | 15.5 | 3.0 | | | | | | |
| 11.25 | 97.8 | 15.1 | 3.1 | | | | | | |
| 12.25 | 94.8 | 16.7 | 4.0 | | | | | | |
| 13.25 | 92.8 | 17.2 | 4.6 | 96 | 15.692 | 5.01 | 0.03 | 0.10 | 0.09 |
| 14.25 | 91.3 | 17.6 | 5.1 | | | | | | |
| 15.25 | 90.0 | 17.8 | 5.5 | | | | | | |
| 16.25 | 91.7 | 16.7 | 5.2 | | | | | | |
| 17.25 | 92.7 | 16.2 | 5.3 | | | | | | |
| 18.25 | 90.9 | 17.0 | 6.1 | | | | | | |
| 19.25 | 91.7 | 16.0 | 5.9 | 80 | 11.351 | 6.01 | 0.15 | 0.41 | 0.02 |
| 20.25 | 0 | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| Validation Carbon Long term Evolution End of Denitrification Belgium | | | | | | | | | |
| Time (d) | Sim | | | Exp | | | ARD | | |
| | S_NH | S_NO2 | S_NO3 | S_NH | S_NO2 | S_NO3 | | | |
| 0.34 | 69.63 | 0.00 | 0.00 | | | | | | |
| 1.34 | 189.24 | 1.19 | 0.01 | | | | | | |
| 2.34 | 201.95 | 1.81 | 0.01 | 185 | | | | | |
| 3.34 | 201.25 | 2.04 | 0.01 | | | | | | |
| 4.34 | 197.46 | 1.86 | 0.01 | | | | | | |
| 5.34 | 194.77 | 1.67 | 0.01 | | | | | | |
| 6.34 | 192.03 | 1.24 | 0.01 | 170 | 0.01 | 0.39 | 0.99 | | 0.91 |
| 7.34 | 195.07 | 1.92 | 0.01 | | | | | | |
| 8.34 | 119.18 | 1.02 | 0.01 | | | | | | |
| 9.34 | 107.55 | 0.26 | 0.01 | | | | | | |
| 10.34 | 104.15 | 0.00 | 0.00 | | | | | | |
| 11.34 | 103.06 | 0.00 | 0.00 | | | | | | |
| 12.34 | 100.73 | 0.00 | 0.00 | | | | | | |
| 13.34 | 99.01 | 0.00 | 0.00 | 96 | 0.01 | 0.01 | 1.23 | | 0.78 |
| 14.34 | 97.57 | 0.00 | 0.00 | | | | | | |
| 15.34 | 96.33 | 0.00 | 0.00 | | | | | | |
| 16.34 | 97.46 | 0.00 | 0.00 | | | | | | |
| 17.34 | 98.08 | 0.00 | 0.00 | | | | | | |
| 18.34 | 96.46 | 0.00 | 0.00 | | | | | | |
| 19.34 | 96.80 | 0.00 | 0.00 | 80 | 0.01 | 0.01 | 1.06 | | 0.78 |
| 20.34 | 0 | 0 | 0 | | | | | | |
| 21.34 | 0 | 0 | 0 | | | | 1.09 | | 0.83 |
| 22.34 | 0 | 0 | 0 | | | | | | |
| 23.34 | 0 | 0 | 0 | | | | | | |
| 24.34 | 0 | 0 | 0 | | | | | | |
| 25.34 | 0 | 0 | 0 | | | | | | |
| 26.34 | 0 | 0 | 0 | | | | | | |
| 27.34 | 0 | 0 | 0 | | | | | | |

| Validation Carbon Cycle Evolution Nutrient Bel | | | | | | | | | | |
|--|----------|-------|-------|-------|------|--------|-------|-------|-------|--------|
| Time (h) | Time (d) | Sim | | | Exp | | | ARD | | |
| | | S_NH | S_NO2 | S_NO3 | S_NH | S_NO2 | S_NO3 | S_NH | S_NO2 | S_NO3 |
| 0 | 16 | 116.0 | 0.0 | 0.0 | 109 | 0.01 | 0.01 | 0.064 | 0.675 | 1.9339 |
| 0.24 | 16.01 | 116.1 | 0.3 | 0.0 | | | | | | |
| 0.48 | 16.02 | 115.0 | 1.0 | 0.1 | | | | | | |
| 0.72 | 16.03 | 113.9 | 1.7 | 0.2 | | | | | | |
| 0.96 | 16.04 | 112.7 | 2.3 | 0.4 | | | | | | |
| 1.2 | 16.05 | 111.6 | 3.0 | 0.5 | | | | | | |
| 1.44 | 16.06 | 110.5 | 3.7 | 0.7 | | | | | | |
| 1.68 | 16.07 | 109.4 | 4.3 | 0.9 | | | | | | |
| 1.92 | 16.08 | 108.3 | 5.0 | 1.1 | 102 | 4 | 2.5 | 0.061 | 0.248 | 0.5683 |
| 2.16 | 16.09 | 107.2 | 5.7 | 1.3 | | | | | | |
| 2.4 | 16.1 | 106.1 | 6.4 | 1.5 | | | | | | |
| 2.64 | 16.11 | 105.0 | 7.1 | 1.7 | | | | | | |
| 2.88 | 16.12 | 103.9 | 7.8 | 2.0 | | | | | | |
| 3.12 | 16.13 | 102.9 | 8.5 | 2.2 | | | | | | |
| 3.36 | 16.14 | 101.8 | 9.2 | 2.4 | | | | | | |
| 3.6 | 16.15 | 100.8 | 9.9 | 2.7 | | | | | | |
| 3.84 | 16.16 | 99.8 | 10.6 | 3.0 | 99 | 7 | 4.8 | 0.008 | 0.52 | 0.3826 |
| 4.08 | 16.17 | 98.7 | 11.4 | 3.2 | | | | | | |
| 4.32 | 16.18 | 97.7 | 12.1 | 3.5 | | | | | | |
| 4.56 | 16.19 | 96.7 | 12.9 | 3.8 | | | | | | |
| 4.8 | 16.2 | 95.7 | 13.6 | 4.1 | | | | | | |
| 5.04 | 16.21 | 94.7 | 14.4 | 4.4 | | | | | | |
| 5.28 | 16.22 | 93.7 | 15.1 | 4.6 | | | | | | |
| 5.52 | 16.23 | 92.7 | 15.9 | 4.9 | | | | | | |
| 5.76 | 16.24 | 91.7 | 16.7 | 5.2 | 96 | 15.692 | 5.01 | 0.044 | 0.062 | 0.0464 |
| 6 | 16.25 | 91.5 | 16.8 | 4.9 | | | | | | |
| 6.24 | 16.26 | 95.9 | 2.4 | 0 | | | | | | |
| 6.48 | 16.27 | 97.3 | 0.1 | 0 | | | | | | |
| 6.72 | 16.28 | 97.4 | 0 | 0 | | | | | | |
| 6.96 | 16.29 | 97.4 | 0 | 0 | | | | | | |
| 7.2 | 16.3 | 97.4 | 0 | 0 | | | | | | |
| 7.44 | 16.31 | 97.5 | 0 | 0 | | | | | | |
| 7.68 | 16.32 | 97.5 | 0 | 0 | | | | | | |
| 7.92 | 16.33 | 97.5 | 0 | 0 | 96 | 0.01 | 0.01 | 0.015 | 0.914 | 1.084 |
| 8.16 | 16.34 | 97.5 | 0 | 0 | | | | | | |
| 8.4 | 16.35 | 97.5 | 0 | 0 | | | | | | |
| 8.64 | 16.36 | 97.5 | 0 | 0 | | | | | | |
| 8.88 | 16.37 | 97.5 | 0 | 0 | | | | | | |
| 9.12 | 16.38 | 97.5 | 0 | 0 | | | | | | |
| 9.36 | 16.39 | 97.5 | 0 | 0 | | | | | | |
| 9.6 | 16.4 | 97.5 | 0 | 0 | | | | | | |
| 9.84 | 16.41 | 97.5 | 0 | 0 | | | | | | |
| 10.08 | 16.42 | 97.5 | 0 | 0 | | | | | | |
| 10.32 | 16.43 | 97.5 | 0 | 0 | | | | | | |
| 10.56 | 16.44 | 97.5 | 0 | 0 | | | | | | |
| 10.8 | 16.45 | 97.5 | 0 | 0 | | | | | | |
| 11.04 | 16.46 | 97.5 | 0 | 0 | | | | | | |
| 11.28 | 16.47 | 97.5 | 0 | 0 | | | | | | |
| 11.52 | 16.48 | 97.5 | 0 | 0 | | | | | | |
| 11.76 | 16.49 | 97.5 | 0 | 0 | | | | | | |
| 12 | 16.5 | 116.1 | 0 | 0 | | | | | | |

| Time (h) | Time (d) | Sim | | | Exp | | | ARD | | |
|----------|----------|-------|-------|-------|------|-------|-------|------|-------|-------|
| | | S_NH | S_NO2 | S_NO3 | S_NH | S_NO2 | S_NO3 | S_NH | S_NO2 | S_NO3 |
| 12.48 | 16.52 | 115.2 | 1.0 | 0.1 | | | | | | |
| 12.72 | 16.53 | 114.1 | 1.7 | 0.2 | | | | | | |
| 12.96 | 16.54 | 113.0 | 2.3 | 0.4 | | | | | | |
| 13.2 | 16.55 | 111.8 | 3.0 | 0.5 | | | | | | |
| 13.44 | 16.56 | 110.7 | 3.6 | 0.7 | | | | | | |
| 13.68 | 16.57 | 109.6 | 4.3 | 0.9 | | | | | | |
| 13.92 | 16.58 | 108.5 | 4.9 | 1.1 | | | | | | |
| 14.16 | 16.59 | 107.4 | 5.6 | 1.3 | | | | | | |
| 14.4 | 16.6 | 106.4 | 6.3 | 1.5 | | | | | | |
| 14.64 | 16.61 | 105.3 | 7.0 | 1.7 | | | | | | |
| 14.88 | 16.62 | 104.3 | 7.7 | 2.0 | | | | | | |
| 15.12 | 16.63 | 103.2 | 8.4 | 2.2 | | | | | | |
| 15.36 | 16.64 | 102.2 | 9.1 | 2.5 | | | | | | |
| 15.6 | 16.65 | 101.1 | 9.8 | 2.7 | | | | | | |
| 15.84 | 16.66 | 100.1 | 10.5 | 3.0 | | | | | | |
| 16.08 | 16.67 | 99.1 | 11.2 | 3.3 | | | | | | |
| 16.32 | 16.68 | 98.1 | 12.0 | 3.5 | | | | | | |
| 16.56 | 16.69 | 97.1 | 12.7 | 3.8 | | | | | | |
| 16.8 | 16.7 | 96.1 | 13.4 | 4.1 | | | | | | |
| 17.04 | 16.71 | 95.1 | 14.2 | 4.4 | | | | | | |
| 17.28 | 16.72 | 94.2 | 14.9 | 4.7 | | | | | | |
| 17.52 | 16.73 | 93.2 | 15.7 | 5.0 | | | | | | |
| 17.76 | 16.74 | 92.2 | 16.4 | 5.3 | | | | | | |
| 18 | 16.75 | 92.0 | 16.6 | 4.9 | | | | | | |
| 18.24 | 16.76 | 96.3 | 2.3 | 0 | | | | | | |
| 18.48 | 16.77 | 97.6 | 0 | 0 | | | | | | |
| 18.72 | 16.78 | 97.7 | 0 | 0 | | | | | | |
| 18.96 | 16.79 | 97.8 | 0 | 0 | | | | | | |
| 19.2 | 16.8 | 97.8 | 0 | 0 | | | | | | |
| 19.44 | 16.81 | 97.8 | 0 | 0 | | | | | | |
| 19.68 | 16.82 | 97.8 | 0 | 0 | | | | | | |
| 19.92 | 16.83 | 97.8 | 0 | 0 | | | | | | |
| 20.16 | 16.84 | 97.8 | 0 | 0 | | | | | | |
| 20.4 | 16.85 | 97.8 | 0 | 0 | | | | | | |
| 20.64 | 16.86 | 97.8 | 0 | 0 | | | | | | |
| 20.88 | 16.87 | 97.8 | 0 | 0 | | | | | | |
| 21.12 | 16.88 | 97.8 | 0 | 0 | | | | | | |
| 21.36 | 16.89 | 97.8 | 0 | 0 | | | | | | |
| 21.6 | 16.9 | 97.8 | 0 | 0 | | | | | | |
| 21.84 | 16.91 | 97.8 | 0 | 0 | | | | | | |
| 22.08 | 16.92 | 97.8 | 0 | 0 | | | | | | |
| 22.32 | 16.93 | 97.8 | 0 | 0 | | | | | | |
| 22.56 | 16.94 | 97.8 | 0 | 0 | | | | | | |
| 22.8 | 16.95 | 97.8 | 0 | 0 | | | | | | |
| 23.04 | 16.96 | 97.8 | 0 | 0 | | | | | | |
| 23.28 | 16.97 | 97.8 | 0 | 0 | | | | | | |
| 23.52 | 16.98 | 97.8 | 0 | 0 | | | | | | |
| 23.76 | 16.99 | 97.8 | 0 | 0 | | | | | | |
| 24 | 19 | 115.7 | 0 | | | | | | | |

| Validation Carbon Cycle Evolution Oxygen Belgium | | | | | | | | | | | | | |
|--|-----------|----------|-----------|----------|-----------|----------|-----------|----------|-----------|----------|-----------|----------|-----------|
| Exp | | | | | | | | | | | | | |
| Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) |
| 0 | 0 | 0.9 | 1.02 | 1.8 | 1.01 | 2.7 | 0.91 | 3.6 | 0.99 | 4.5 | 1.06 | 5.4 | 0.91 |
| 0.017 | 0.02 | 0.917 | 1.06 | 1.817 | 1.09 | 2.717 | 1.1 | 3.617 | 0.92 | 4.517 | 1.04 | 5.417 | 1 |
| 0.033 | 2.48 | 0.933 | 0.91 | 1.833 | 1.06 | 2.733 | 1.09 | 3.633 | 1.1 | 4.533 | 1.01 | 5.433 | 1.13 |
| 0.05 | 2.23 | 0.95 | 0.93 | 1.85 | 0.88 | 2.75 | 0.96 | 3.65 | 0.96 | 4.55 | 1.02 | 5.45 | 1.08 |
| 0.067 | 1.76 | 0.967 | 1.17 | 1.867 | 0.92 | 2.767 | 1.11 | 3.667 | 0.96 | 4.567 | 1.05 | 5.467 | 0.97 |
| 0.083 | 1.71 | 0.983 | 1.1 | 1.883 | 1.03 | 2.783 | 1 | 3.683 | 1.02 | 4.583 | 1.1 | 5.483 | 1.03 |
| 0.1 | 1.54 | 1 | 0.98 | 1.9 | 1.05 | 2.8 | 0.93 | 3.7 | 0.95 | 4.6 | 1.02 | 5.5 | 1.18 |
| 0.117 | 1.28 | 1.017 | 1.05 | 1.917 | 1.1 | 2.817 | 0.81 | 3.717 | 0.91 | 4.617 | 0.99 | 5.517 | 1.13 |
| 0.133 | 0.87 | 1.033 | 0.96 | 1.933 | 1 | 2.833 | 1.16 | 3.733 | 1.11 | 4.633 | 0.96 | 5.533 | 0.83 |
| 0.15 | 1.48 | 1.05 | 1 | 1.95 | 0.95 | 2.85 | 1.15 | 3.75 | 0.89 | 4.65 | 0.87 | 5.55 | 1.23 |
| 0.167 | 1.51 | 1.067 | 1.09 | 1.967 | 0.85 | 2.867 | 0.85 | 3.767 | 1.23 | 4.667 | 1.03 | 5.567 | 1.18 |
| 0.183 | 1.2 | 1.083 | 1.03 | 1.983 | 1.04 | 2.883 | 1.16 | 3.783 | 1.09 | 4.683 | 0.97 | 5.583 | 1.02 |
| 0.2 | 1 | 1.1 | 0.94 | 2 | 0.97 | 2.9 | 1.02 | 3.8 | 1.06 | 4.7 | 0.96 | 5.6 | 0.97 |
| 0.217 | 1.27 | 1.117 | 1.09 | 2.017 | 0.98 | 2.917 | 0.93 | 3.817 | 0.61 | 4.717 | 0.98 | 5.617 | 0.91 |
| 0.233 | 1.21 | 1.133 | 0.94 | 2.033 | 0.99 | 2.933 | 0.99 | 3.833 | 1.12 | 4.733 | 1.04 | 5.633 | 1.05 |
| 0.25 | 0.9 | 1.15 | 0.96 | 2.05 | 1.03 | 2.95 | 1 | 3.85 | 1.07 | 4.75 | 1.06 | 5.65 | 1.03 |
| 0.267 | 1.38 | 1.167 | 1.04 | 2.067 | 0.98 | 2.967 | 0.94 | 3.867 | 1.13 | 4.767 | 1.07 | 5.667 | 0.95 |
| 0.283 | 1.01 | 1.183 | 1.08 | 2.083 | 0.97 | 2.983 | 1 | 3.883 | 0.89 | 4.783 | 1.07 | 5.683 | 0.93 |
| 0.3 | 0.27 | 1.2 | 0.95 | 2.1 | 0.99 | 3 | 0.98 | 3.9 | 0.96 | 4.8 | 0.78 | 5.7 | 1.12 |
| 0.317 | 1.11 | 1.217 | 0.91 | 2.117 | 0.86 | 3.017 | 1.01 | 3.917 | 1.12 | 4.817 | 1.2 | 5.717 | 1.04 |
| 0.333 | 1.07 | 1.233 | 1.11 | 2.133 | 1.23 | 3.033 | 1.04 | 3.933 | 1.1 | 4.833 | 1.12 | 5.733 | 0.94 |
| 0.35 | 0.55 | 1.25 | 0.99 | 2.15 | 1.11 | 3.05 | 1.02 | 3.95 | 1.08 | 4.85 | 1.06 | 5.75 | 0.91 |
| 0.367 | 1.14 | 1.267 | 1.02 | 2.167 | 0.88 | 3.067 | 1 | 3.967 | 0.89 | 4.867 | 0.82 | 5.767 | 0.84 |
| 0.383 | 1.16 | 1.283 | 1.04 | 2.183 | 1.28 | 3.083 | 1.08 | 3.983 | 0.98 | 4.883 | 1.12 | 5.783 | 1.15 |
| 0.4 | 1.09 | 1.3 | 0.83 | 2.2 | 1.14 | 3.1 | 1.01 | 4 | 1.08 | 4.9 | 1.17 | 5.8 | 1.02 |
| 0.417 | 0.72 | 1.317 | 1.02 | 2.217 | 0.83 | 3.117 | 0.99 | 4.017 | 1.03 | 4.917 | 1.08 | 5.817 | 0.88 |
| 0.433 | 1.17 | 1.333 | 1.1 | 2.233 | 1.14 | 3.133 | 0.99 | 4.033 | 0.98 | 4.933 | 1 | 5.833 | 1.05 |
| 0.45 | 0.86 | 1.35 | 0.96 | 2.25 | 0.94 | 3.15 | 0.89 | 4.05 | 0.66 | 4.95 | 0.94 | 5.85 | 0.97 |
| 0.467 | 1.12 | 1.367 | 1.08 | 2.267 | 1.1 | 3.167 | 1.17 | 4.067 | 1.07 | 4.967 | 1.14 | 5.867 | 1.02 |
| 0.483 | 1.05 | 1.383 | 0.96 | 2.283 | 1.12 | 3.183 | 1.03 | 4.083 | 1.04 | 4.983 | 1 | 5.883 | 0.99 |
| 0.5 | 0.91 | 1.4 | 0.87 | 2.3 | 0.86 | 3.2 | 1.07 | 4.1 | 0.97 | 5 | 0.92 | 5.9 | 1 |
| 0.517 | 0.91 | 1.417 | 1.06 | 2.317 | 1.15 | 3.217 | 1.04 | 4.117 | 1.02 | 5.017 | 0.73 | 5.917 | 0.99 |
| 0.533 | 1.21 | 1.433 | 1.01 | 2.333 | 1 | 3.233 | 1.03 | 4.133 | 1.13 | 5.033 | 1.14 | 5.933 | 1.06 |
| 0.55 | 0.97 | 1.45 | 0.98 | 2.35 | 0.95 | 3.25 | 0.88 | 4.15 | 1.06 | 5.05 | 1.07 | 5.95 | 0.98 |
| 0.567 | 0.94 | 1.467 | 1.06 | 2.367 | 1.03 | 3.267 | 1.1 | 4.167 | 0.91 | 5.067 | 1 | 5.967 | 1.03 |
| 0.583 | 0.99 | 1.483 | 1 | 2.383 | 0.99 | 3.283 | 1.04 | 4.183 | 1.13 | 5.083 | 1 | 5.983 | 1.08 |
| 0.6 | 1.04 | 1.5 | 1.03 | 2.4 | 0.96 | 3.3 | 1.03 | 4.2 | 1 | 5.1 | 1.04 | 6 | 1.01 |
| 0.617 | 1.02 | 1.517 | 0.96 | 2.417 | 1.13 | 3.317 | 0.82 | 4.217 | 0.97 | 5.117 | 0.99 | 6.017 | 0.89 |
| 0.633 | 1.07 | 1.533 | 0.97 | 2.433 | 1.03 | 3.333 | 1.15 | 4.233 | 0.98 | 5.133 | 1.12 | 6.033 | 1.23 |
| 0.65 | 0.97 | 1.55 | 1.09 | 2.45 | 0.86 | 3.35 | 1.08 | 4.25 | 1.24 | 5.15 | 1.05 | 6.05 | 1.11 |
| 0.667 | 0.89 | 1.567 | 0.98 | 2.467 | 1.21 | 3.367 | 0.87 | 4.267 | 1.06 | 5.167 | 1.04 | 6.067 | 0.88 |
| 0.683 | 1.13 | 1.583 | 1.08 | 2.483 | 1 | 3.383 | 1.04 | 4.283 | 1.05 | 5.183 | 0.8 | 6.083 | 0.7 |
| 0.7 | 0.95 | 1.6 | 0.98 | 2.5 | 0.97 | 3.4 | 1.06 | 4.3 | 1.02 | 5.2 | 1.1 | 6.1 | 0.51 |
| 0.717 | 1.03 | 1.617 | 1.01 | 2.517 | 0.95 | 3.417 | 0.96 | 4.317 | 0.94 | 5.217 | 1.04 | 6.117 | 0.42 |
| 0.733 | 0.94 | 1.633 | 0.94 | 2.533 | 1.09 | 3.433 | 1.07 | 4.333 | 0.73 | 5.233 | 1.05 | 6.133 | 0.31 |
| 0.75 | 1.01 | 1.65 | 0.99 | 2.55 | 0.97 | 3.45 | 0.98 | 4.35 | 1.18 | 5.25 | 0.75 | 6.15 | 0.19 |
| 0.767 | 0.96 | 1.667 | 1.02 | 2.567 | 0.59 | 3.467 | 0.95 | 4.367 | 1.1 | 5.267 | 1.03 | 6.167 | 0.12 |
| 0.783 | 1.01 | 1.683 | 1.06 | 2.583 | 1.3 | 3.483 | 0.99 | 4.383 | 0.94 | 5.283 | 1.21 | 6.183 | 0.02 |
| 0.8 | 1.01 | 1.7 | 1.07 | 2.6 | 1.17 | 3.5 | 0.96 | 4.4 | 1.13 | 5.3 | 1.07 | 6.2 | 0.1 |
| 0.817 | 0.96 | 1.717 | 0.99 | 2.617 | 0.93 | 3.517 | 1.01 | 4.417 | 1.1 | 5.317 | 1.02 | 6.217 | 0.01 |
| 0.833 | 0.99 | 1.733 | 1 | 2.633 | 1.21 | 3.533 | 0.98 | 4.433 | 1.01 | 5.333 | 0.86 | 6.233 | 0.01 |
| 0.85 | 0.96 | 1.75 | 0.94 | 2.65 | 1.1 | 3.55 | 1.02 | 4.45 | 0.98 | 5.35 | 1.04 | 6.25 | 0.07 |
| 0.867 | 1.05 | 1.767 | 0.94 | 2.667 | 0.9 | 3.567 | 0.99 | 4.467 | 0.73 | 5.367 | 1.15 | 6.267 | 0.05 |

| Exp | | | | | | | | | | | | | |
|----------|-----------|----------|-----------|----------|-----------|----------|-----------|----------|-----------|----------|-----------|----------|-----------|
| Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) | Time (d) | DO (mg/L) |
| 6.3 | 0 | 7.25 | 0.02 | 8.2 | 0.05 | 9.15 | 0.05 | 10.1 | 0.05 | 11.05 | 0.05 | 12 | 0.05 |
| 6.317 | 0.02 | 7.267 | 0.01 | 8.217 | 0.05 | 9.167 | 0.05 | 10.12 | 0.05 | 11.07 | 0.05 | | |
| 6.333 | 0.02 | 7.283 | 0.1 | 8.233 | 0.05 | 9.183 | 0.05 | 10.13 | 0.05 | 11.08 | 0.05 | | |
| 6.35 | 0.01 | 7.3 | 0.02 | 8.25 | 0.05 | 9.2 | 0.05 | 10.15 | 0.05 | 11.1 | 0.05 | | |
| 6.367 | 0.03 | 7.317 | 0.06 | 8.267 | 0.05 | 9.217 | 0.05 | 10.17 | 0.05 | 11.12 | 0.05 | | |
| 6.383 | 0.01 | 7.333 | 0.01 | 8.283 | 0.05 | 9.233 | 0.05 | 10.18 | 0.04 | 11.13 | 0.05 | | |
| 6.4 | 0.07 | 7.35 | 0.01 | 8.3 | 0.04 | 9.25 | 0.05 | 10.2 | 0.05 | 11.15 | 0.05 | | |
| 6.417 | 0.05 | 7.367 | 0 | 8.317 | 0.05 | 9.267 | 0.05 | 10.22 | 0.05 | 11.17 | 0.05 | | |
| 6.433 | 0.07 | 7.383 | 0 | 8.333 | 0.05 | 9.283 | 0.05 | 10.23 | 0.05 | 11.18 | 0.05 | | |
| 6.45 | 0.07 | 7.4 | 0.01 | 8.35 | 0.05 | 9.3 | 0.05 | 10.25 | 0.05 | 11.2 | 0.05 | | |
| 6.467 | 0 | 7.417 | 0.02 | 8.367 | 0.05 | 9.317 | 0.05 | 10.27 | 0.05 | 11.22 | 0.04 | | |
| 6.483 | 0.09 | 7.433 | 0.01 | 8.383 | 0.05 | 9.333 | 0.05 | 10.28 | 0.05 | 11.23 | 0.05 | | |
| 6.5 | 0.07 | 7.45 | 0.07 | 8.4 | 0.05 | 9.35 | 0.04 | 10.3 | 0.05 | 11.25 | 0.05 | | |
| 6.517 | 0 | 7.467 | 0 | 8.417 | 0.05 | 9.367 | 0.05 | 10.32 | 0.05 | 11.27 | 0.05 | | |
| 6.533 | 0.09 | 7.483 | 0.02 | 8.433 | 0.05 | 9.383 | 0.05 | 10.33 | 0.05 | 11.28 | 0.05 | | |
| 6.55 | 0.02 | 7.5 | 0.04 | 8.45 | 0.05 | 9.4 | 0.05 | 10.35 | 0.05 | 11.3 | 0.05 | | |
| 6.567 | 0.01 | 7.517 | 0 | 8.467 | 0.05 | 9.417 | 0.05 | 10.37 | 0.05 | 11.32 | 0.05 | | |
| 6.583 | 0.1 | 7.533 | 0.08 | 8.483 | 0.05 | 9.433 | 0.05 | 10.38 | 0.04 | 11.33 | 0.05 | | |
| 6.6 | 0.02 | 7.55 | 0.02 | 8.5 | 0.05 | 9.45 | 0.05 | 10.4 | 0.05 | 11.35 | 0.05 | | |
| 6.617 | 0.06 | 7.567 | 0.01 | 8.517 | 0.04 | 9.467 | 0.05 | 10.42 | 0.05 | 11.37 | 0.05 | | |
| 6.633 | 0.01 | 7.583 | 0.07 | 8.533 | 0.05 | 9.483 | 0.05 | 10.43 | 0.05 | 11.38 | 0.05 | | |
| 6.65 | 0.01 | 7.6 | 0 | 8.55 | 0.05 | 9.5 | 0.05 | 10.45 | 0.05 | 11.4 | 0.05 | | |
| 6.667 | 0 | 7.617 | 0.02 | 8.567 | 0.05 | 9.517 | 0.05 | 10.47 | 0.05 | 11.42 | 0.05 | | |
| 6.683 | 0 | 7.633 | 0.04 | 8.583 | 0.05 | 9.533 | 0.05 | 10.48 | 0.05 | 11.43 | 0.04 | | |
| 6.7 | 0.01 | 7.65 | 0 | 8.6 | 0.05 | 9.55 | 0.04 | 10.5 | 0.05 | 11.45 | 0.05 | | |
| 6.717 | 0.02 | 7.667 | 0.08 | 8.617 | 0.05 | 9.567 | 0.05 | 10.52 | 0.05 | 11.47 | 0.05 | | |
| 6.733 | 0.01 | 7.683 | 0.07 | 8.633 | 0.05 | 9.583 | 0.05 | 10.53 | 0.05 | 11.48 | 0.05 | | |
| 6.75 | 0.07 | 7.7 | 0 | 8.65 | 0.05 | 9.6 | 0.05 | 10.55 | 0.05 | 11.5 | 0.05 | | |
| 6.767 | 0 | 7.717 | 0.09 | 8.667 | 0.05 | 9.617 | 0.05 | 10.57 | 0.05 | 11.52 | 0.05 | | |
| 6.783 | 0.02 | 7.733 | 0.02 | 8.683 | 0.05 | 9.633 | 0.05 | 10.58 | 0.05 | 11.53 | 0.05 | | |
| 6.8 | 0.04 | 7.75 | 0.01 | 8.7 | 0.05 | 9.65 | 0.05 | 10.6 | 0.04 | 11.55 | 0.05 | | |
| 6.817 | 0 | 7.767 | 0.1 | 8.717 | 0.04 | 9.667 | 0.05 | 10.62 | 0.05 | 11.57 | 0.05 | | |
| 6.833 | 0.08 | 7.783 | 0.02 | 8.733 | 0.05 | 9.683 | 0.05 | 10.63 | 0.05 | 11.58 | 0.05 | | |
| 6.85 | 0.07 | 7.8 | 0.06 | 8.75 | 0.05 | 9.7 | 0.05 | 10.65 | 0.05 | 11.6 | 0.05 | | |
| 6.867 | 0 | 7.817 | 0.01 | 8.767 | 0.05 | 9.717 | 0.05 | 10.67 | 0.05 | 11.62 | 0.05 | | |
| 6.883 | 0.09 | 7.833 | 0.09 | 8.783 | 0.05 | 9.733 | 0.05 | 10.68 | 0.05 | 11.63 | 0.04 | | |
| 6.9 | 0.02 | 7.85 | 0.02 | 8.8 | 0.05 | 9.75 | 0.05 | 10.7 | 0.05 | 11.65 | 0.05 | | |
| 6.917 | 0.01 | 7.867 | 0.01 | 8.817 | 0.05 | 9.767 | 0.04 | 10.72 | 0.05 | 11.67 | 0.05 | | |
| 6.933 | 0.1 | 7.883 | 0.1 | 8.833 | 0.05 | 9.783 | 0.05 | 10.73 | 0.05 | 11.68 | 0.05 | | |
| 6.95 | 0.02 | 7.9 | 0.02 | 8.85 | 0.05 | 9.8 | 0.05 | 10.75 | 0.05 | 11.7 | 0.05 | | |
| 6.967 | 0.06 | 7.917 | 0.06 | 8.867 | 0.05 | 9.817 | 0.05 | 10.77 | 0.05 | 11.72 | 0.05 | | |
| 6.983 | 0.01 | 7.933 | 0.01 | 8.883 | 0.05 | 9.833 | 0.05 | 10.78 | 0.05 | 11.73 | 0.05 | | |
| 7 | 0.01 | 7.95 | 0.01 | 8.9 | 0.05 | 9.85 | 0.05 | 10.8 | 0.04 | 11.75 | 0.05 | | |
| 7.017 | 0 | 7.967 | 0 | 8.917 | 0.05 | 9.867 | 0.05 | 10.82 | 0.05 | 11.77 | 0.05 | | |
| 7.033 | 0 | 7.983 | 0 | 8.933 | 0.04 | 9.883 | 0.05 | 10.83 | 0.05 | 11.78 | 0.05 | | |
| 7.05 | 0.01 | 8 | 0.01 | 8.95 | 0.05 | 9.9 | 0.05 | 10.85 | 0.05 | 11.8 | 0.05 | | |
| 7.067 | 0.02 | 8.017 | 0.05 | 8.967 | 0.05 | 9.917 | 0.05 | 10.87 | 0.05 | 11.82 | 0.04 | | |
| 7.083 | 0.01 | 8.033 | 0.05 | 8.983 | 0.05 | 9.933 | 0.05 | 10.88 | 0.05 | 11.83 | 0.05 | | |
| 7.1 | 0.07 | 8.05 | 0.05 | 9 | 0.05 | 9.95 | 0.05 | 10.9 | 0.05 | 11.85 | 0.05 | | |
| 7.117 | 0 | 8.067 | 0.05 | 9.017 | 0.05 | 9.967 | 0.04 | 10.92 | 0.05 | 11.87 | 0.05 | | |
| 7.133 | 0.02 | 8.083 | 0.05 | 9.033 | 0.05 | 9.983 | 0.05 | 10.93 | 0.05 | 11.88 | 0.05 | | |
| 7.15 | 0.04 | 8.1 | 0.04 | 9.05 | 0.05 | 10 | 0.05 | 10.95 | 0.05 | 11.9 | 0.05 | | |
| 7.167 | 0 | 8.117 | 0.05 | 9.067 | 0.05 | 10.02 | 0.05 | 10.97 | 0.05 | 11.92 | 0.05 | | |
| 7.183 | 0.08 | 8.133 | 0.05 | 9.083 | 0.05 | 10.03 | 0.05 | 10.98 | 0.05 | 11.93 | 0.05 | | |
| 7.2 | 0.07 | 8.15 | 0.05 | 9.1 | 0.05 | 10.05 | 0.05 | 11 | 0.05 | 11.95 | 0.05 | | |

| Sim | |
|----------|-----------|
| Time (d) | DO (mg/L) |
| 16 | 0.00 |
| 16.01 | 0.24 |
| 16.02 | 1.44 |
| 16.03 | 1.61 |
| 16.04 | 1.67 |
| 16.05 | 1.74 |
| 16.06 | 1.81 |
| 16.07 | 1.88 |
| 16.08 | 1.94 |
| 16.09 | 2.01 |
| 16.1 | 2.07 |
| 16.11 | 2.14 |
| 16.12 | 2.20 |
| 16.13 | 2.26 |
| 16.14 | 2.31 |
| 16.15 | 2.37 |
| 16.16 | 2.42 |
| 16.17 | 2.47 |
| 16.18 | 2.52 |
| 16.19 | 2.56 |
| 16.2 | 2.61 |
| 16.21 | 2.65 |
| 16.22 | 2.69 |
| 16.23 | 2.72 |
| 16.24 | 2.76 |
| 16.25 | 2.79 |
| 16.26 | 0 |
| 16.27 | 0 |
| 16.28 | 0 |
| 16.29 | 0 |
| 16.3 | 0 |
| 16.31 | 0 |
| 16.32 | 0 |
| 16.33 | 0 |
| 16.34 | 0 |
| 16.35 | 0 |
| 16.36 | 0 |
| 16.37 | 0 |
| 16.38 | 0 |
| 16.39 | 0 |
| 16.4 | 0 |
| 16.41 | 0 |
| 16.42 | 0 |
| 16.43 | 0 |
| 16.44 | 0 |
| 16.45 | 0 |
| 16.46 | 0 |
| 16.47 | 0 |
| 16.48 | 0 |
| 16.49 | 0 |
| 16.5 | 0 |

| Scenario analysis Exp vs Sim NH4 with DO 5 | | | | | | | | | |
|--|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Sim | | | | | | | | | |
| | Run18 | Run17 | Run16 | Run18 | Run17 | Run16 | Run18 | Run17 | Run16 |
| Time (day) | 6Ni-2De-V6L | 5Ni-3De-V6L | 4Ni-4De-V6L | 6Ni-2De-V7L | 5Ni-3De-V7L | 4Ni-4De-V7L | 6Ni-2De-V8L | 5Ni-3De-V8L | 4Ni-4De-V8L |
| 6.51 | 349 | 350 | 351 | 359 | 355 | 351 | 352 | 353 | 354 |
| 6.52 | 341 | 343 | 344 | 351 | 347 | 344 | 345 | 346 | 347 |
| 6.53 | 331 | 333 | 334 | 343 | 339 | 335 | 337 | 339 | 340 |
| 6.54 | 321 | 323 | 325 | 334 | 330 | 326 | 330 | 331 | 333 |
| 6.55 | 311 | 313 | 315 | 324 | 321 | 317 | 322 | 324 | 326 |
| 6.56 | 301 | 303 | 305 | 315 | 311 | 307 | 315 | 317 | 319 |
| 6.57 | 291 | 293 | 295 | 306 | 302 | 298 | 307 | 309 | 312 |
| 6.58 | 282 | 283 | 285 | 296 | 293 | 289 | 300 | 302 | 304 |
| 6.59 | 272 | 274 | 275 | 287 | 283 | 280 | 292 | 294 | 297 |
| 6.6 | 262 | 264 | 266 | 278 | 274 | 271 | 284 | 286 | 289 |
| 6.61 | 252 | 254 | 256 | 268 | 265 | 261 | 276 | 279 | 282 |
| 6.62 | 242 | 244 | 246 | 259 | 255 | 252 | 268 | 271 | 274 |
| 6.63 | 232 | 234 | 236 | 250 | 246 | 243 | 260 | 263 | 266 |
| 6.64 | 222 | 224 | 226 | 240 | 237 | 233 | 251 | 255 | 259 |
| 6.65 | 211 | 214 | 216 | 231 | 227 | 224 | 243 | 247 | 251 |
| 6.66 | 201 | 204 | 206 | 221 | 218 | 215 | 235 | 239 | 243 |
| 6.67 | 191 | 194 | 199 | 212 | 209 | 209 | 227 | 231 | 238 |
| 6.68 | 181 | 184 | 199 | 202 | 199 | 209 | 219 | 223 | 238 |
| 6.69 | 171 | 174 | 200 | 193 | 190 | 209 | 211 | 215 | 238 |
| 6.7 | 161 | 164 | 200 | 183 | 180 | 209 | 203 | 207 | 237 |
| 6.71 | 151 | 155 | 200 | 174 | 172 | 209 | 194 | 200 | 237 |
| 6.72 | 141 | 155 | 200 | 165 | 172 | 209 | 186 | 200 | 237 |
| 6.73 | 131 | 155 | 200 | 155 | 172 | 209 | 178 | 200 | 237 |
| 6.74 | 121 | 155 | 200 | 146 | 173 | 209 | 170 | 200 | 237 |
| 6.75 | 111 | 156 | 200 | 136 | 173 | 209 | 162 | 200 | 237 |
| 6.76 | 111 | 156 | 200 | 136 | 173 | 209 | 161 | 200 | 237 |
| 6.77 | 111 | 156 | 200 | 136 | 173 | 209 | 161 | 200 | 237 |
| 6.78 | 111 | 156 | 200 | 136 | 173 | 209 | 161 | 200 | 237 |
| 6.79 | 111 | 156 | 200 | 136 | 173 | 209 | 161 | 200 | 237 |
| 6.8 | 111 | 156 | 200 | 136 | 173 | 209 | 161 | 200 | 237 |
| 6.81 | 111 | 156 | 200 | 136 | 173 | 209 | 161 | 200 | 237 |
| 6.82 | 111 | 156 | 200 | 136 | 173 | 209 | 161 | 200 | 237 |
| 6.83 | 111 | 156 | 200 | 136 | 173 | 209 | 161 | 200 | 237 |
| 6.84 | 111 | 156 | 200 | 137 | 173 | 209 | 161 | 200 | 237 |
| 6.85 | 111 | 156 | 200 | 137 | 173 | 209 | 161 | 200 | 237 |
| 6.86 | 111 | 156 | 200 | 137 | 173 | 209 | 161 | 200 | 237 |
| 6.87 | 111 | 156 | 200 | 137 | 173 | 209 | 161 | 200 | 237 |
| 6.88 | 111 | 156 | 200 | 137 | 173 | 209 | 161 | 200 | 237 |
| 6.89 | 111 | 156 | 200 | 137 | 173 | 209 | 161 | 200 | 237 |
| 6.9 | 111 | 156 | 200 | 137 | 173 | 209 | 161 | 200 | 237 |
| 6.91 | 111 | 156 | 200 | 137 | 173 | 209 | 161 | 200 | 237 |
| 6.92 | 111 | 156 | 200 | 137 | 173 | 209 | 161 | 200 | 237 |
| 6.93 | 111 | 156 | 200 | 137 | 173 | 209 | 161 | 200 | 237 |
| 6.94 | 111 | 156 | 200 | 137 | 173 | 209 | 161 | 200 | 237 |
| 6.95 | 111 | 156 | 200 | 137 | 173 | 209 | 161 | 200 | 237 |
| 6.96 | 111 | 156 | 200 | 137 | 173 | 209 | 161 | 200 | 237 |
| 6.97 | 111 | 156 | 200 | 137 | 173 | 209 | 161 | 200 | 237 |
| 6.98 | 111 | 156 | 200 | 137 | 173 | 209 | 161 | 200 | 237 |
| 6.99 | 111 | 156 | 200 | 137 | 173 | 209 | 161 | 200 | 237 |
| 7 | 111 | 156 | 200 | 137 | 173 | 209 | 161 | 200 | 237 |

| Exp | | | | | | | | | |
|------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| | Run18 | Run17 | Run16 | Run18 | Run17 | Run16 | Run18 | Run17 | Run16 |
| Time (day) | 6Ni-2De-V6L | 5Ni-3De-V6L | 4Ni-4De-V6L | 6Ni-2De-V7L | 5Ni-3De-V7L | 4Ni-4De-V7L | 6Ni-2De-V8L | 5Ni-3De-V8L | 4Ni-4De-V8L |
| 0 | 354 | 350 | 354 | 364 | 357 | 358 | 358 | 353 | 360 |
| 1 | 294 | 305 | 301 | 293 | 298 | 311 | 311 | 321 | 323 |
| 2 | 261 | 233 | 259 | 248 | 264 | 254 | 268 | 279 | 274 |
| 3 | 200 | 201 | 231 | 205 | 232 | 237 | 242 | 267 | 242 |
| 4 | 174 | 175 | 202 | 188 | 198 | 205 | 203 | 223 | 229 |
| 5 | 136 | 147 | 193 | 158 | 167 | 205 | 188 | 191 | 224 |
| 6 | 104.4 | 143 | 190 | 138 | 163 | 206 | 167 | 189 | 225 |
| 7 | 100.75 | 141 | 183 | 133.5 | 164 | 204 | 165 | 186 | 222 |
| 8 | 97.8 | 141 | 183 | 127 | 164 | 202.5 | 164 | 186 | 222 |
| 9 | 97.8 | 141 | 183 | 127 | 164 | 202.5 | 164 | 186 | 222 |
| 10 | 97.8 | 141 | 183 | 127 | 164 | 202.5 | 164 | 186 | 222 |
| 11 | 97.8 | 141 | 183 | 127 | 164 | 202.5 | 164 | 186 | 222 |
| 12 | 97.8 | 141 | 183 | 127 | 164 | 202.5 | 164 | 186 | 222 |
| | | | | | | | | | |
| AUR-Slm | 39.7164 | 38.9756 | 37.936 | 37.1673 | 36.508 | 35.5518 | 31.8049 | 30.6395 | 29.109 |
| AUR-Exp | 41.6 | 40.6 | 38 | 37.6667 | 38 | 38.25 | 31.8333 | 32.4 | 32.75 |
| | | | | | | | | | |
| | 4.52787 | 4.00107 | 0.16847 | 1.3258 | 3.92628 | 7.05415 | 0.08919 | 5.43358 | 11.1175 |

| Scenario analysis Exp vs Sim NH4 with DO 5 | | | | | | | | | |
|--|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|
| Sim | | | | | | | | | |
| Time (day) | Run18 6Ni- 2De- V6L | Run17 5Ni- 3De- V6L | Run16 4Ni- 4De- V6L | Run18 6Ni- 2De- V7L | Run17 5Ni- 3De- V7L | Run16 4Ni- 4De- V7L | Run18 6Ni- 2De- V8L | Run17 5Ni- 3De- V8L | Run16 4Ni- 4De- V8L |
| 6.51 | 117 | 116 | 115 | 111 | 115 | 119 | 120 | 112 | 114 |
| 6.52 | 120 | 119 | 118 | 113 | 118 | 121 | 127 | 118 | 120 |
| 6.53 | 128 | 127 | 127 | 118 | 123 | 127 | 134 | 125 | 127 |
| 6.54 | 137 | 136 | 135 | 126 | 130 | 134 | 140 | 132 | 133 |
| 6.55 | 145 | 144 | 143 | 134 | 138 | 142 | 147 | 138 | 139 |
| 6.56 | 154 | 153 | 152 | 142 | 146 | 149 | 154 | 145 | 146 |
| 6.57 | 163 | 162 | 160 | 149 | 154 | 157 | 160 | 151 | 152 |
| 6.58 | 172 | 170 | 169 | 157 | 161 | 165 | 167 | 158 | 158 |
| 6.59 | 180 | 179 | 177 | 165 | 169 | 173 | 174 | 165 | 165 |
| 6.6 | 189 | 188 | 186 | 173 | 177 | 180 | 181 | 172 | 172 |
| 6.61 | 198 | 196 | 195 | 181 | 185 | 188 | 189 | 179 | 179 |
| 6.62 | 207 | 205 | 203 | 190 | 193 | 196 | 196 | 186 | 186 |
| 6.63 | 216 | 214 | 212 | 198 | 201 | 204 | 203 | 193 | 193 |
| 6.64 | 225 | 223 | 221 | 206 | 210 | 212 | 211 | 200 | 200 |
| 6.65 | 234 | 232 | 229 | 214 | 218 | 220 | 218 | 208 | 207 |
| 6.66 | 242 | 240 | 238 | 222 | 226 | 229 | 226 | 215 | 214 |
| 6.67 | 251 | 249 | 244 | 231 | 234 | 234 | 233 | 222 | 219 |
| 6.68 | 260 | 258 | 243 | 239 | 243 | 233 | 241 | 230 | 218 |
| 6.69 | 269 | 267 | 242 | 247 | 251 | 232 | 248 | 237 | 217 |
| 6.7 | 278 | 276 | 241 | 256 | 259 | 231 | 256 | 245 | 217 |
| 6.71 | 287 | 283 | 240 | 264 | 266 | 230 | 264 | 251 | 216 |
| 6.72 | 296 | 282 | 239 | 273 | 265 | 229 | 271 | 250 | 215 |
| 6.73 | 305 | 282 | 238 | 281 | 264 | 228 | 279 | 250 | 215 |
| 6.74 | 314 | 281 | 238 | 290 | 263 | 227 | 287 | 249 | 214 |
| 6.75 | 324 | 280 | 237 | 298 | 262 | 226 | 294 | 249 | 214 |
| 6.76 | 323 | 279 | 236 | 297 | 261 | 225 | 294 | 248 | 213 |
| 6.77 | 322 | 278 | 235 | 296 | 261 | 224 | 294 | 248 | 213 |
| 6.78 | 321 | 277 | 234 | 296 | 260 | 223 | 293 | 247 | 212 |
| 6.79 | 320 | 277 | 233 | 295 | 259 | 222 | 293 | 247 | 212 |
| 6.8 | 320 | 276 | 233 | 294 | 258 | 222 | 292 | 246 | 212 |
| 6.81 | 319 | 275 | 232 | 293 | 257 | 221 | 292 | 246 | 211 |
| 6.82 | 318 | 274 | 231 | 292 | 256 | 220 | 291 | 246 | 211 |
| 6.83 | 317 | 274 | 230 | 291 | 256 | 219 | 291 | 245 | 210 |
| 6.84 | 317 | 273 | 230 | 291 | 255 | 219 | 291 | 245 | 210 |
| 6.85 | 317 | 273 | 230 | 291 | 255 | 219 | 291 | 245 | 210 |
| 6.86 | 317 | 273 | 230 | 291 | 255 | 219 | 291 | 245 | 210 |
| 6.87 | 317 | 273 | 230 | 291 | 255 | 219 | 291 | 245 | 210 |
| 6.88 | 317 | 273 | 230 | 291 | 255 | 219 | 291 | 245 | 210 |
| 6.89 | 317 | 273 | 230 | 291 | 255 | 219 | 291 | 245 | 210 |
| 6.9 | 317 | 273 | 230 | 291 | 255 | 219 | 291 | 245 | 210 |
| 6.91 | 317 | 273 | 230 | 291 | 255 | 219 | 291 | 245 | 210 |
| 6.92 | 317 | 273 | 230 | 291 | 255 | 219 | 291 | 245 | 210 |
| 6.93 | 317 | 273 | 230 | 291 | 255 | 219 | 291 | 245 | 210 |
| 6.94 | 317 | 273 | 230 | 291 | 255 | 219 | 291 | 245 | 210 |
| 6.95 | 317 | 273 | 230 | 291 | 255 | 219 | 291 | 245 | 210 |
| 6.96 | 317 | 273 | 230 | 291 | 255 | 219 | 291 | 245 | 210 |
| 6.97 | 317 | 273 | 230 | 291 | 255 | 219 | 291 | 245 | 210 |
| 6.98 | 317 | 273 | 230 | 291 | 255 | 219 | 291 | 245 | 210 |
| 6.99 | 317 | 273 | 230 | 291 | 255 | 219 | 291 | 245 | 210 |
| 7 | 317 | 273 | 230 | 291 | 255 | 219 | 291 | 245 | 210 |