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Technical Memorandum

Prepared for: Ebb Carbon (EC)

Project Title: Project Macoma, LLC, Preliminary Design

Project No.: 195862

Technical Memorandum

Subject: Port Angeles Mixing Analyses, pH 12 Addendum

Date: October 8, 2024

To: Todd Pelman (EC)

From: Matt DeBoer, Brown and Caldwell (BC)

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Expires 4/11/2025

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Table of Contents

List of Figures

List of Tables

Section 1: Overview

This technical memorandum provides the results of supplemental model analyses prepared for Ebb Carbon and Project Macoma to assess discharges of pH 12 (12 standard units [s.u.]) under limited Scientific Operations. Previous Scientific Operations scenarios were modeled at pH 13.5 (13.5 s.u.). The analyses contained in this addendum applied the same dilution (UM3) and water chemistry (OLI Studio) modeling methodology and ambient water quality values.

The subsequent sections summarize scenario characteristics, dilution model results, and pH water quality analyses for Scientific Operations discharging at pH 12. In addition, water quality analyses include an evaluation of model sensitivity with respect to varying ambient pH values within Port Angeles Harbor.

The results of this analysis demonstrate that the mixed pH of Port Angeles Harbor waters and Project Macoma Ebb Carbon effluent at pH 12 is predicted to reach near ambient conditions, ≤ 0.1 pH change, within approximately 1 meter from the proposed diffuser discharge for nearly all ambient pH conditions. At low pH ambient conditions (pH = 7.5), the mixed pH achieves near ambient conditions within approximately 5 meters.

Section 2: Effluent Scenario Characteristics

Dilution and water chemistry modeling herein were prepared for Scientific Operations at pH = 12, shown in Table 1.

Table 1. Effluent Flow and Water Quality Summary

Scenario	Frequency	Duration	Discharge Flow (L/hr)	Temperature (deg C)	Density (kg/m^3)	pH (s.u.)
Scientific Operations						
Alkaline product only (12.0 pH)	A few times per month	Single ebb tidal cycle	5,900	30.0	996.4	12.0

deg C = degrees Celsius

L/hr = liters per hour

kg/m^3 = kilogram per cubic meter

Section 3: Dilution Model Results

All dilution model analyses herein assume maximum stratification conditions, which yield a lower predicted dilution for Scientific Operations at pH 12 as compared to minimum stratification conditions. As shown in Figure 1, the buoyant effluent plume is predicted to rise to the water surface approximately 4 meters (13 feet) laterally from the multi-port diffuser at the assumed 50th percentile current speeds. The UM3 model terminates at the point the effluent plume surfaces marking the completion of nearfield mixing. Additional farfield dilution occurs within the mixing zone but at a much lower magnitude. Consistent with previous analyses, the model results herein conservatively do not account for farfield mixing.

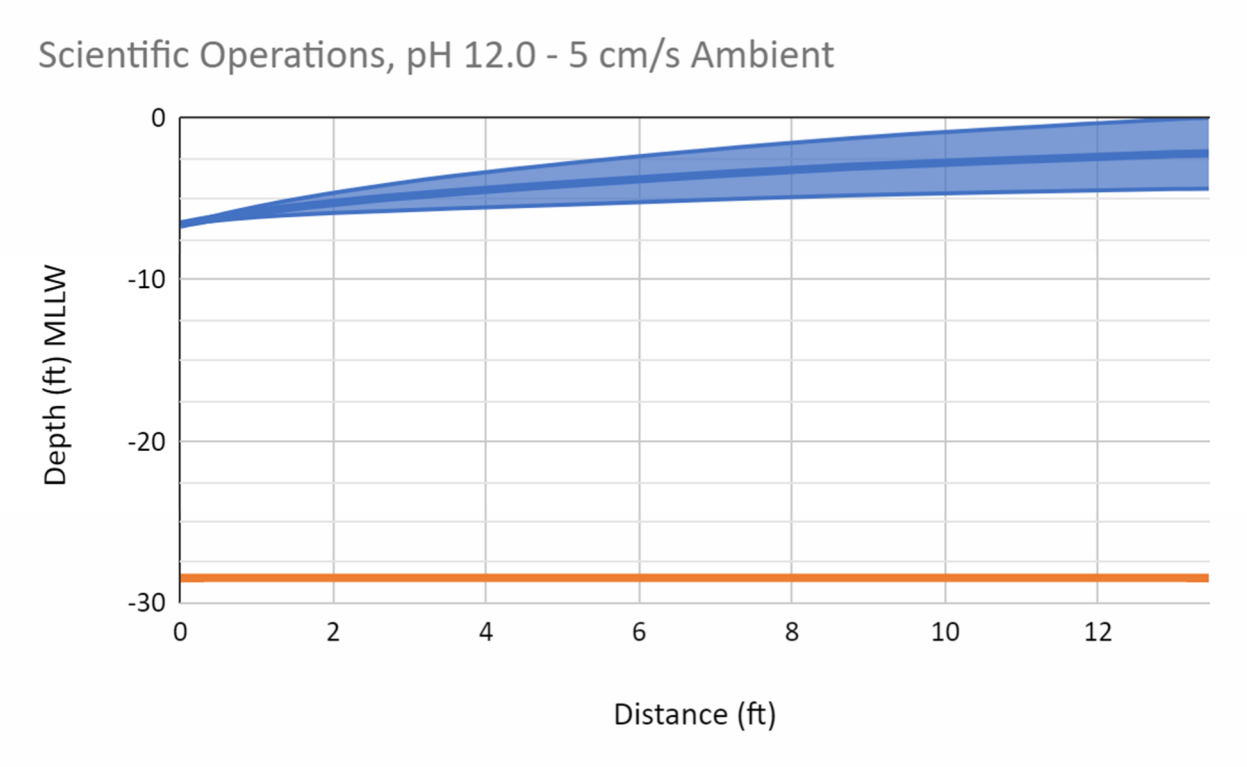

Figure 1. Predicted plume location. Plot shows the centerline and diameter of plume as a function of depth (blue) in reference to the surface and seafloor (orange) at mean lower low water (MLLW).

Dilution model results for Scientific Operations at pH 12 are summarized in Table 2 below. Minimum acute and nearfield dilutions assume 10th percentile and 50th percentile ambient current speeds, respectively. UM3 model input/output data are provided in Attachment A.

Table 2. Dilution Model Results Summary

Scenario	Minimum Acute Dilution [a]	Minimum Nearfield Dilution [b]	Nearfield Mixing Distance (m)	Effluent Plume Centerline Depth (m)
Scientific operations, alkaline product only (pH = 12.0)	175:1	860:1	4.1	Surface

[a] *Minimum acute dilution reported at the effluent plume centerline.*

[b] *Minimum nearfield dilution reported as the flux average dilution of the effluent plume.*

Section 4: Water Quality Analyses

The OLI model was used to predict mixed pH at the predicted minimum nearfield dilution for Scientific Operations (pH 12). pH water quality analysis results for Scientific Operations (pH 12) are summarized in Table 3. Consistent with previous analyses, the water quality analyses account for tidal reflux and use a nearfield dilution equal to half of the model predicted dilution. This assumption is potentially too conservative as operation of Scientific Operations is likely to be for limited durations and constrained to ebb tidal conditions where tidal reflux is not significant. OLI model outputs are provided in Attachment B.

Table 3. pH Water Quality Analyses Summary

Scenario	Chronic Dilution [a]	Effluent pH	Mixed pH [b]	pH Change
Scientific operations, alkaline product only (pH = 12.0)	430:1	12.0	7.9	0.1

[a] *Minimum nearfield dilution divided by two to account for tidal reflux.*

[b] *OLI model runs assume an ambient pH of 7.78.*

Section 5: Scientific Operations (pH 12) Conclusions

As reported in Table 3, the nearfield mixing conditions, which occur within 13 feet of discharge results in a pH change of 0.1 s.u. Therefore, the conditions requiring a National Pollutant Discharge Elimination System Tier 2 determination are not applicable as the anticipated pH change is less than 0.1 s.u. at the point of compliance (chronic mixing zone 200.7 feet from the point of discharge), especially in consideration of the conservative, and potentially not applicable, reflux assumptions.

Section 6: Ambient pH Condition Sensitivity Analysis

In addition to the Scientific Operations (pH 12) evaluation, the UM3 and OLI models were used to evaluate the sensitivity of mixed pH results to Port Angeles Harbor under a range of ambient pH conditions. The sensitivity range was applied between 7.5 and 8.5 s.u. at chronic dilution conditions (current speed = 0.5 centimeters per second) and accounting for tidal reflux. Figure 2 provides predicted mixed pH with distance from the discharge for ambient harbor pH equal to 7.5, 7.78 (consistent with the base case), 8.4, and 8.5. Table 4 provides specific distances at which the mixed pH reaches near ambient conditions, less than ≤ 0.1 pH change, both with and without accounting for tidal reflux. As shown in Figure 2 and Table 4, mixed pH rapidly decreases to near ambient conditions within approximately 1 meter for all conditions except at an ambient pH of 7.5. At low pH ambient conditions, the mixed pH achieves near ambient conditions within approximately 5 meters, or less, if eliminating the conservative tidal reflux assumption.

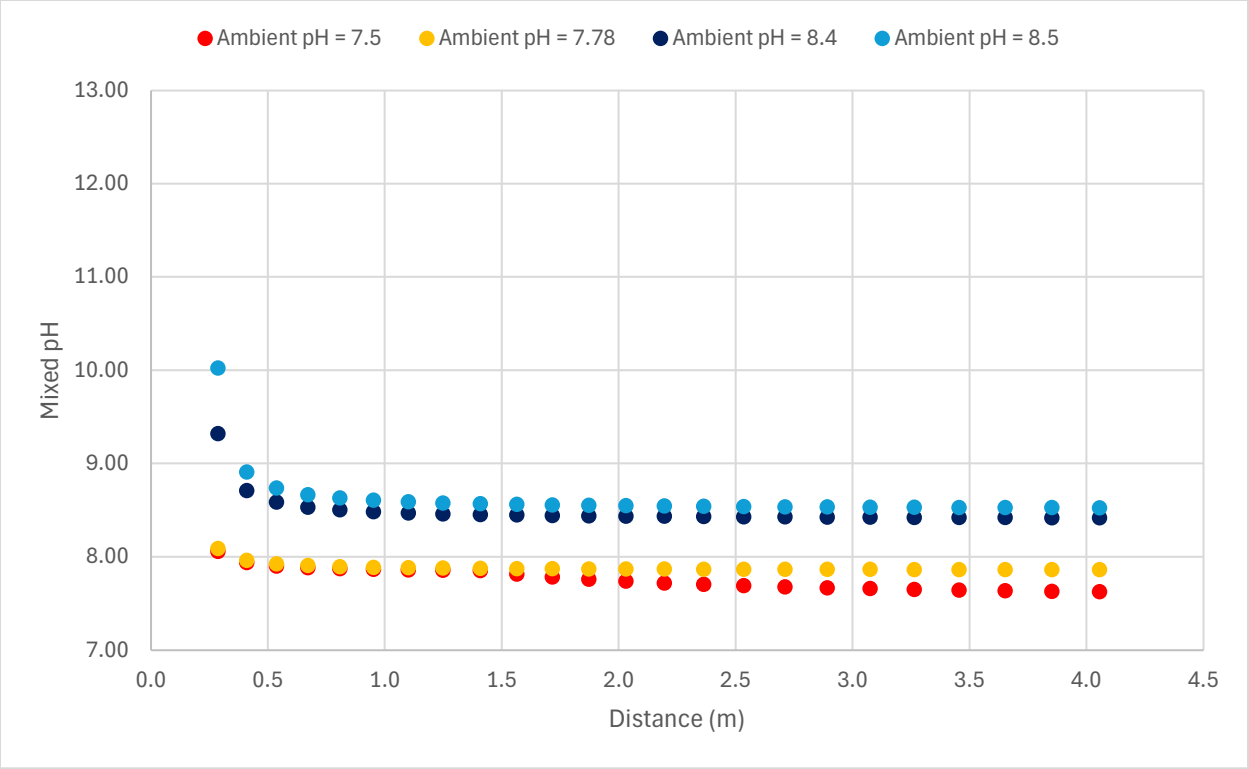

Figure 2. Ambient pH sensitivity analysis results

Table 4. Ambient pH Sensitivity Analysis Summary

	Distance at which mixed pH reaches ≤ 0.1 pH change from ambient pH			
	Ambient pH = 7.5	Ambient pH = 7.78	Ambient pH = 8.4	Ambient pH = 8.5
With tidal reflux: chronic dilution = 430:1	4.1[a]	1.2	0.8	1.1
Without tidal reflux: chronic dilution = 860:1	2.2	0.7	0.5	0.6

Section 7: Supporting Ambient Scenario Conclusions

The mixed pH of Port Angeles Harbor waters and Project Macoma discharge at Scientific Operations (pH 12) condition is predicted to reach near ambient conditions, ≤ 0.1 pH change, within approximately 1 meter from the proposed diffuser discharge for nearly all ambient pH conditions. At low pH ambient conditions (pH = 7.5), the mixed pH achieves near ambient conditions within approximately 5 meters.

Attachment A: Dilution Model Input/Output

Scientific Operations – Alkaline Product Only (pH = 12)

Acute Conditions

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Ambient Table:
     Depth   Amb-cur   Amb-dir   Amb-sal   Amb-tem   Amb-pol      Decay   Far-spd   Far-dir   Disprsn   Density
         m       m/s       deg       psu         C     kg/kg       s-1       m/s       deg  m0.67/s2   sigma-T
       0.0     0.020     90.00     30.95     11.20       0.0       0.0         -         -    0.0003  23.61783
     3.000     0.020     90.00     31.17     10.35       0.0       0.0         -         -    0.0003  23.93386
     6.000     0.020     90.00     31.16     9.690       0.0       0.0         -         -    0.0003  24.03388
     9.000     0.020     90.00     31.68     9.440       0.0       0.0         -         -    0.0003  24.47871
     12.00     0.020     90.00     31.76     9.340       0.0       0.0         -         -    0.0003  24.55686
     15.00     0.020     90.00     31.87     9.220       0.0       0.0         -         -    0.0003  24.66148

Diffuser table:
   P-diaVer angl H-Angle SourceX SourceY   Ports Spacing  MZ-dis Isoplth P-depth Ttl-flo Eff-den    Temp Polutnt
    (in)   (deg)   (deg)     (m)     (m)      ()    (ft)    (ft)(concent)     (m)  (m3/s) (kg/m3)     (C)     (%)
  0.5000  45.000  90.000     0.0     0.0  25.000  2.0000  200.00      0.0  2.0000 1.64E-3  996.40  30.000  100.00

Simulation:
Froude No:     8.844; Strat No: 4.89E-5; Spcg No:   48.00; k:   25.89; eff den (sigmaT) -3.600000; eff vel     0.518(r
        Depth  Amb-cur    P-dia  Polutnt   Dilutn  CL-diln   x-posn   y-posn     Time   Iso dia
Step      (m)   (cm/s)     (in)      (%)       ()       ()      (m)      (m)      (s)      (m)
   0    2.000    2.000    0.500    100.0    1.000    1.000      0.0      0.0      0.0      0.0;
  50    1.962    2.000    1.289    36.77    2.720    1.360    0.000   0.0375    0.184   0.03274;
 100    1.868    2.000    2.920    13.74    7.276    3.638    0.000    0.119    1.086   0.07418;
 150    1.682    2.000    5.801    5.118    19.54    9.770    0.000    0.240    3.640    0.1473;
 200    1.371    2.000    10.97    1.903    52.55    26.28    0.000    0.407    9.189    0.2787;
 250    0.895    2.000    20.75    0.707    141.4    70.71    0.000    0.679    20.59    0.5271;
 262    0.753    2.000    24.27    0.558    179.3    89.67    0.000    0.771    24.77    0.6165; merging;
 288    0.322    2.000    35.09    0.334    299.4    169.3    0.000    1.095    39.88    0.8913; matched energy radia
 290    0.286    2.000    36.10    0.323    309.7    177.2    0.000    1.125    41.32    0.9169; surface;
Horiz plane projections in effluent direction: radius(m):      0.0; CL(m):   1.1249
Lmz(m):   1.1249
forced entrain      1   318.5   1.714   0.917   0.642
Rate sec-1          0.0 dy-1          0.0  kt:          0.0 Amb Sal      30.9723
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Chronic Conditions

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Ambient Table:
     Depth   Amb-cur   Amb-dir   Amb-sal   Amb-tem   Amb-pol      Decay   Far-spd   Far-dir   Disprsn   Density
         m       m/s       deg       psu         C     kg/kg       s-1       m/s       deg  m0.67/s2   sigma-T
       0.0     0.050     90.00     30.95     11.20       0.0       0.0         -         -    0.0003  23.61783
     3.000     0.050     90.00     31.17     10.35       0.0       0.0         -         -    0.0003  23.93386
     6.000     0.050     90.00     31.16     9.690       0.0       0.0         -         -    0.0003  24.03388
     9.000     0.050     90.00     31.68     9.440       0.0       0.0         -         -    0.0003  24.47871
     12.00     0.050     90.00     31.76     9.340       0.0       0.0         -         -    0.0003  24.55686
     15.00     0.050     90.00     31.87     9.220       0.0       0.0         -         -    0.0003  24.66148

Diffuser table:
   P-diaVer angl H-Angle SourceX SourceY   Ports Spacing  MZ-dis Isoplth P-depth Ttl-flo Eff-den    Temp Polutnt
    (in)   (deg)   (deg)     (m)     (m)      ()    (ft)    (ft)(concent)     (m)  (m3/s) (kg/m3)     (C)     (%)
  0.5000  45.000  90.000     0.0     0.0  25.000  2.0000  200.00      0.0  2.0000 1.64E-3  996.40  30.000  100.00

Simulation:
Froude No:     8.844; Strat No: 4.89E-5; Spcg No:   48.00; k:   10.36; eff den (sigmaT) -3.600000; eff vel     0.518(r
        Depth  Amb-cur    P-dia  Polutnt   Dilutn  CL-diln   x-posn   y-posn     Time   Iso dia
Step      (m)   (cm/s)     (in)      (%)       ()       ()      (m)      (m)      (s)      (m)
   0    2.000    5.000    0.500    100.0    1.000    1.000      0.0      0.0      0.0   0.0127;
  50    1.965    5.000    1.250    36.84    2.714    1.357    0.000   0.0367    0.166   0.03176;
 100    1.906    5.000    2.790    13.77    7.262    3.631    0.000    0.106    0.761   0.07086;
 150    1.821    5.000    5.568    5.128    19.50    9.751    0.000    0.217    2.246    0.1414;
 200    1.701    5.000    10.24    1.907    52.45    26.22    0.000    0.404    5.404    0.2601;
 250    1.527    5.000    17.89    0.709    141.1    70.57    0.000    0.754    11.93    0.4543;
 278    1.393    5.000    24.12    0.407    245.7    122.8    0.000    1.087    18.38   0.6126; merging;
 300    1.232    5.000    30.75    0.263    379.8    204.3    0.000    1.558    27.62   0.7809;
 326    0.915    5.000    42.23    0.157    635.6    392.3    0.000    2.662    49.45   1.0727; trap level;
 350    0.674    5.000    51.84    0.118    845.5    563.7    0.000    3.962    75.23   1.3166;
 353    0.658    5.000    52.54    0.116    860.3    573.5    0.000    4.103    78.03   1.3344; surface;
Horiz plane projections in effluent direction: radius(m):      0.0; CL(m):   4.1027
Lmz(m):   4.1027
forced entrain      1   623.5   1.342   1.334   0.994
Rate sec-1          0.0 dy-1          0.0  kt:          0.0 Amb Sal      30.9986
```

Attachment B: Chemistry Model Output

Alkaline Product at pH of 12.0, PoPA WQ pH is at 7.78

Ratio	Volume PoPA L/hr	Total Volume L/hr	pH	Temperature °C	TDS mg/L	Density kg/m³	Cl(-1) mg/L
0	0	5900	12.0	30.0	648	996.4	0
18.6	1.10E+05	1.16E+05	8.09	9.38	32,101	1,024	17,464
37.3	2.20E+05	2.26E+05	7.96	8.83	32,969	1,025	17,920
55.9	3.30E+05	3.36E+05	7.92	8.64	33,268	1,025	18,077
74.6	4.40E+05	4.46E+05	7.91	8.54	33,419	1,025	18,157
93.2	5.50E+05	5.56E+05	7.90	8.48	33,511	1,025	18,205
112	6.60E+05	6.66E+05	7.89	8.45	33,572	1,025	18,237
131	7.70E+05	7.76E+05	7.88	8.42	33,616	1,025	18,260
149	8.80E+05	8.86E+05	7.88	8.40	33,649	1,025	18,278
168	9.90E+05	9.96E+05	7.88	8.38	33,675	1,025	18,291
186	1.10E+06	1.11E+06	7.87	8.37	33,696	1,025	18,302
186	1.10E+06	1.11E+06	7.87	8.37	33,696	1,025	18,302
203	1.20E+06	1.21E+06	7.87	8.36	33,711	1,025	18,310
220	1.30E+06	1.31E+06	7.87	8.35	33,724	1,026	18,317
237	1.40E+06	1.41E+06	7.87	8.34	33,735	1,026	18,323
254	1.50E+06	1.51E+06	7.87	8.34	33,745	1,026	18,328
271	1.60E+06	1.61E+06	7.87	8.33	33,754	1,026	18,333
288	1.70E+06	1.71E+06	7.87	8.33	33,761	1,026	18,336
305	1.80E+06	1.81E+06	7.87	8.32	33,768	1,026	18,340
322	1.90E+06	1.91E+06	7.87	8.32	33,774	1,026	18,343
339	2.00E+06	2.01E+06	7.86	8.32	33,779	1,026	18,346
356	2.10E+06	2.11E+06	7.86	8.31	33,784	1,026	18,349
373	2.20E+06	2.21E+06	7.86	8.31	33,789	1,026	18,351
390	2.30E+06	2.31E+06	7.86	8.31	33,793	1,026	18,353
407	2.40E+06	2.41E+06	7.86	8.30	33,796	1,026	18,355
424	2.50E+06	2.51E+06	7.86	8.30	33,800	1,026	18,357
441	2.60E+06	2.61E+06	7.86	8.30	33,803	1,026	18,358
458	2.70E+06	2.71E+06	7.86	8.30	33,806	1,026	18,360
475	2.80E+06	2.81E+06	7.86	8.30	33,809	1,026	18,361
492	2.90E+06	2.91E+06	7.86	8.29	33,811	1,026	18,363
508	3.00E+06	3.01E+06	7.86	8.29	33,813	1,026	18,364
525	3.10E+06	3.11E+06	7.86	8.29	33,816	1,026	18,365
593	3.50E+06	3.51E+06	7.86	8.29	33,823	1,026	18,369
814	4.80E+06	4.81E+06	7.86	8.28	33,839	1,026	18,377
1,034	6.10E+06	6.11E+06	7.86	8.27	33,848	1,026	18,382
1,254	7.40E+06	7.41E+06	7.86	8.27	33,854	1,026	18,385
1,475	8.70E+06	8.71E+06	7.86	8.27	33,858	1,026	18,388
1,695	1.00E+07	1.00E+07	7.86	8.26	33,861	1,026	18,389

Alkaline Product at pH of 12.0, PoPA WQ pH is at 7.5

Ratio	Volume PoPA L/hr	Total Volume L/hr	pH	Temperature °C	TDS mg/L	Density kg/m³	Cl(-1) mg/L
0	0	5900	12.0	30.0	648	996.4	0
18.6	1.10E+05	1.16E+05	8.06	9.38	32,114	1,024	17,468
37.3	2.20E+05	2.26E+05	7.94	8.83	32,982	1,025	17,924
55.9	3.30E+05	3.36E+05	7.90	8.64	33,281	1,025	18,081
74.6	4.40E+05	4.46E+05	7.88	8.54	33,433	1,025	18,161
93.2	5.50E+05	5.56E+05	7.87	8.49	33,524	1,025	18,209
112	6.60E+05	6.66E+05	7.87	8.45	33,586	1,025	18,241
131	7.70E+05	7.76E+05	7.86	8.42	33,630	1,025	18,264
149	8.80E+05	8.86E+05	7.86	8.40	33,663	1,025	18,281
168	9.90E+05	9.96E+05	7.85	8.38	33,688	1,025	18,295
186	1.10E+06	1.11E+06	7.81	8.37	33,708	1,025	18,306
186	1.10E+06	1.11E+06	7.81	8.37	33,708	1,025	18,306
203	1.20E+06	1.21E+06	7.78	8.36	33,722	1,025	18,314
220	1.30E+06	1.31E+06	7.76	8.35	33,735	1,026	18,321
237	1.40E+06	1.41E+06	7.74	8.34	33,745	1,026	18,327
254	1.50E+06	1.51E+06	7.72	8.34	33,754	1,026	18,332
271	1.60E+06	1.61E+06	7.70	8.33	33,762	1,026	18,336
288	1.70E+06	1.71E+06	7.69	8.33	33,769	1,026	18,340
305	1.80E+06	1.81E+06	7.68	8.32	33,776	1,026	18,344
322	1.90E+06	1.91E+06	7.67	8.32	33,781	1,026	18,347
339	2.00E+06	2.01E+06	7.66	8.32	33,786	1,026	18,350
356	2.10E+06	2.11E+06	7.65	8.31	33,791	1,026	18,352
373	2.20E+06	2.21E+06	7.64	8.31	33,795	1,026	18,355
390	2.30E+06	2.31E+06	7.64	8.31	33,799	1,026	18,357
407	2.40E+06	2.41E+06	7.63	8.30	33,802	1,026	18,359
424	2.50E+06	2.51E+06	7.62	8.30	33,806	1,026	18,361
441	2.60E+06	2.61E+06	7.62	8.30	33,808	1,026	18,362
458	2.70E+06	2.71E+06	7.61	8.30	33,811	1,026	18,364
475	2.80E+06	2.81E+06	7.61	8.30	33,814	1,026	18,365
492	2.90E+06	2.91E+06	7.61	8.29	33,816	1,026	18,366
508	3.00E+06	3.01E+06	7.60	8.29	33,818	1,026	18,368
525	3.10E+06	3.11E+06	7.60	8.29	33,820	1,026	18,369
593	3.50E+06	3.51E+06	7.59	8.29	33,827	1,026	18,373
814	4.80E+06	4.81E+06	7.56	8.28	33,842	1,026	18,381
1,034	6.10E+06	6.11E+06	7.55	8.27	33,851	1,026	18,386
1,254	7.40E+06	7.41E+06	7.54	8.27	33,856	1,026	18,389
1,475	8.70E+06	8.71E+06	7.53	8.27	33,860	1,026	18,391
1,695	1.00E+07	1.00E+07	7.53	8.26	33,863	1,026	18,393

Alkaline Product at pH of 12.0, PoPA WQ pH is at 8.4

Ratio	Volume PoPA L/hr	Total Volume L/hr	pH	Temperature °C	TDS mg/L	Density kg/m³	Cl(-1) mg/L
0	0	5900	12.0	30.0	648	996.4	0
18.6	1.10E+05	1.16E+05	9.32	9.38	31,986	1,024	17,464
37.3	2.20E+05	2.26E+05	8.71	8.83	32,847	1,025	17,920
55.9	3.30E+05	3.36E+05	8.59	8.64	33,146	1,025	18,077
74.6	4.40E+05	4.46E+05	8.53	8.54	33,297	1,025	18,157
93.2	5.50E+05	5.56E+05	8.50	8.48	33,389	1,025	18,205
112	6.60E+05	6.66E+05	8.48	8.45	33,450	1,025	18,237
131	7.70E+05	7.76E+05	8.47	8.42	33,494	1,025	18,260
149	8.80E+05	8.86E+05	8.46	8.40	33,527	1,025	18,278
168	9.90E+05	9.96E+05	8.45	8.38	33,553	1,025	18,291
186	1.10E+06	1.11E+06	8.45	8.37	33,573	1,025	18,302
186	1.10E+06	1.11E+06	8.45	8.37	33,573	1,025	18,302
203	1.20E+06	1.21E+06	8.44	8.36	33,589	1,025	18,310
220	1.30E+06	1.31E+06	8.44	8.35	33,602	1,025	18,317
237	1.40E+06	1.41E+06	8.44	8.34	33,613	1,026	18,323
254	1.50E+06	1.51E+06	8.43	8.34	33,623	1,026	18,328
271	1.60E+06	1.61E+06	8.43	8.33	33,631	1,026	18,333
288	1.70E+06	1.71E+06	8.43	8.33	33,639	1,026	18,336
305	1.80E+06	1.81E+06	8.43	8.32	33,645	1,026	18,340
322	1.90E+06	1.91E+06	8.43	8.32	33,651	1,026	18,343
339	2.00E+06	2.01E+06	8.42	8.32	33,657	1,026	18,346
356	2.10E+06	2.11E+06	8.42	8.31	33,662	1,026	18,349
373	2.20E+06	2.21E+06	8.42	8.31	33,666	1,026	18,351
390	2.30E+06	2.31E+06	8.42	8.31	33,670	1,026	18,353
407	2.40E+06	2.41E+06	8.42	8.30	33,674	1,026	18,355
424	2.50E+06	2.51E+06	8.42	8.30	33,677	1,026	18,357
441	2.60E+06	2.61E+06	8.42	8.30	33,680	1,026	18,358
458	2.70E+06	2.71E+06	8.42	8.30	33,683	1,026	18,360
475	2.80E+06	2.81E+06	8.42	8.30	33,686	1,026	18,361
492	2.90E+06	2.91E+06	8.42	8.29	33,688	1,026	18,363
508	3.00E+06	3.01E+06	8.42	8.29	33,691	1,026	18,364
525	3.10E+06	3.11E+06	8.42	8.29	33,693	1,026	18,365
593	3.50E+06	3.51E+06	8.42	8.29	33,700	1,026	18,369
814	4.80E+06	4.81E+06	8.41	8.28	33,716	1,026	18,377
1,034	6.10E+06	6.11E+06	8.41	8.27	33,725	1,026	18,382
1,254	7.40E+06	7.41E+06	8.41	8.27	33,731	1,026	18,385
1,475	8.70E+06	8.71E+06	8.41	8.27	33,735	1,026	18,388
1,695	1.00E+07	1.00E+07	8.41	8.26	33,738	1,026	18,389

Alkaline Product at pH of 12.0, PoPA WQ pH is at 8.5

Ratio	Volume PoPA L/hr	Total Volume L/hr	pH	Temperature °C	TDS mg/L	Density kg/m³	Cl(-1) mg/L
0	0	5900	12.0	30.0	648	996.4	0
18.6	1.10E+05	1.16E+05	10.03	9.38	31,980	1,024	17,464
37.3	2.20E+05	2.26E+05	8.91	8.83	32,835	1,025	17,920
55.9	3.30E+05	3.36E+05	8.74	8.64	33,133	1,025	18,077
74.6	4.40E+05	4.46E+05	8.67	8.54	33,284	1,025	18,157
93.2	5.50E+05	5.56E+05	8.63	8.48	33,376	1,025	18,205
112	6.60E+05	6.66E+05	8.61	8.45	33,437	1,025	18,237
131	7.70E+05	7.76E+05	8.59	8.42	33,481	1,025	18,260
149	8.80E+05	8.86E+05	8.58	8.40	33,514	1,025	18,278
168	9.90E+05	9.96E+05	8.57	8.38	33,539	1,025	18,291
186	1.10E+06	1.11E+06	8.56	8.37	33,560	1,025	18,302
186	1.10E+06	1.11E+06	8.56	8.37	33,560	1,025	18,302
203	1.20E+06	1.21E+06	8.56	8.36	33,575	1,025	18,310
220	1.30E+06	1.31E+06	8.55	8.35	33,589	1,025	18,317
237	1.40E+06	1.41E+06	8.55	8.34	33,600	1,026	18,323
254	1.50E+06	1.51E+06	8.54	8.34	33,609	1,026	18,328
271	1.60E+06	1.61E+06	8.54	8.33	33,618	1,026	18,333
288	1.70E+06	1.71E+06	8.54	8.33	33,626	1,026	18,336
305	1.80E+06	1.81E+06	8.54	8.32	33,632	1,026	18,340
322	1.90E+06	1.91E+06	8.53	8.32	33,638	1,026	18,343
339	2.00E+06	2.01E+06	8.53	8.32	33,644	1,026	18,346
356	2.10E+06	2.11E+06	8.53	8.31	33,648	1,026	18,349
373	2.20E+06	2.21E+06	8.53	8.31	33,653	1,026	18,351
390	2.30E+06	2.31E+06	8.53	8.31	33,657	1,026	18,353
407	2.40E+06	2.41E+06	8.53	8.30	33,661	1,026	18,355
424	2.50E+06	2.51E+06	8.53	8.30	33,664	1,026	18,357
441	2.60E+06	2.61E+06	8.52	8.30	33,667	1,026	18,358
458	2.70E+06	2.71E+06	8.52	8.30	33,670	1,026	18,360
475	2.80E+06	2.81E+06	8.52	8.30	33,673	1,026	18,361
492	2.90E+06	2.91E+06	8.52	8.29	33,675	1,026	18,363
508	3.00E+06	3.01E+06	8.52	8.29	33,678	1,026	18,364
525	3.10E+06	3.11E+06	8.52	8.29	33,680	1,026	18,365
593	3.50E+06	3.51E+06	8.52	8.29	33,688	1,026	18,369
814	4.80E+06	4.81E+06	8.51	8.28	33,703	1,026	18,377
1,034	6.10E+06	6.11E+06	8.51	8.27	33,713	1,026	18,382
1,254	7.40E+06	7.41E+06	8.51	8.27	33,718	1,026	18,385
1,475	8.70E+06	8.71E+06	8.51	8.27	33,723	1,026	18,388
1,695	1.00E+07	1.00E+07	8.51	8.26	33,726	1,026	18,389