# APPENDIX E

## List of Potential Minerals for Reaction-State Modeling (Well V258)

# Appendix E
# SOLMINEQ88 Output for Well V258

**SAMPLE IDENTIFIER: V258**

| PH | EH | TEMP | | CATIONS | ANIONS | DIFFERENCE (MEQ/L) |
|---|---|---|---|---|---|---|
| 7.30 | 9.0000 | 19.80 | ANAL= | 3.4472 | 3.4317 | 0.0155 |
| | | | CALC= | 3.4187 | 3.4030 | 0.0156 |

| DENSITY AT INPUT T | TOTAL DISSOLVED SOLIDS (MG/L) | IONIC STRENGTH | ACTIVITY OF WATER | P TOTAL (BARS) | PH2O (BARS) | PCO2 (BARS) |
|---|---|---|---|---|---|---|
| 1.0002 | 359.21 | 0.00419 | 0.9999 | 1.0000 | 0.2310E-01 | 0.8949E-02 |

**LIST OF AQUEOUS SPECIES**

| | | ANALYZED | | | CALCULATED | | | | ACTIVITY | -LOG10 |
|---|---|---|---|---|---|---|---|---|---|---|
| | SPECIES | PPM | MG/L | MOLALITY | PPM | MG/L | MOLALITY | ACTIVITY | COEFF. | ACTIVITY |
| 1 | Ca ++ | 16.9958 | 17.0000 | 0.4242E-03 | 0.1651E+02 | 0.1651E+02 | 0.4120E-03 | 0.3153E-03 | 0.7653 | 3.5013 |
| 2 | Mg ++ | 4.0990 | 4.1000 | 0.1687E-03 | 0.3974E+01 | 0.3975E+01 | 0.1635E-03 | 0.1264E-03 | 0.7727 | 3.8984 |
| 3 | Na + | 37.9906 | 38.0000 | 0.1653E-02 | 0.3793E+02 | 0.3794E+02 | 0.1651E-02 | 0.1540E-02 | 0.9331 | 2.8124 |
| 4 | K + | 7.6981 | 7.7000 | 0.1969E-03 | 0.7698E+01 | 0.7700E+01 | 0.1969E-03 | 0.1835E-03 | 0.9318 | 3.7363 |
| 5 | Cl - | 9.9975 | 10.0000 | 0.2821E-03 | 0.9995E+01 | 0.9997E+01 | 0.2820E-03 | 0.2628E-03 | 0.9318 | 3.5804 |
| 7 | HCO3 - | 187.9535 | 188.0000 | 0.3081E-02 | 0.1855E+03 | 0.1855E+03 | 0.3041E-02 | 0.2840E-02 | 0.9338 | 2.5468 |
| 8 | H + | | | | 0.5379E-04 | 0.5380E-04 | 0.5338E-07 | 0.5012E-07 | 0.9389 | 7.3000 |
| 9 | OH - | | | | 0.2471E-02 | 0.2472E-02 | 0.1454E-06 | 0.1356E-06 | 0.9325 | 6.8679 |
| 11 | H4SiO4 | | | | 0.1275E+03 | 0.1276E+03 | 0.1327E-02 | 0.1628E-02 | 1.2266 | 2.7883 |
| 12 | SiO2 | 79.9802 | 80.0000 | 0.1332E-02 | | | | | | |
| 14 | Al +3 | 0.0600 | 0.0600 | 0.2224E-05 | 0.2972E-06 | 0.2973E-06 | 0.1102E-10 | 0.6231E-11 | 0.5654 | 11.2055 |
| 15 | Ba ++ | 0.0250 | 0.0250 | 0.1821E-06 | 0.2364E-01 | 0.2365E-01 | 0.1722E-06 | 0.1311E-06 | 0.7613 | 6.8823 |
| 18 | Fe ++ | 10.9973 | 11.0000 | 0.1970E-03 | 0.1096E+02 | 0.1096E+02 | 0.1963E-03 | 0.1502E-03 | 0.7653 | 3.8233 |
| 23 | Mn ++ | 0.2899 | 0.2900 | 0.5279E-05 | 0.2781E+00 | 0.2781E+00 | 0.5063E-05 | 0.3875E-05 | 0.7653 | 5.4117 |
| 27 | Zn ++ | 0.0087 | 0.0087 | 0.1331E-06 | 0.8119E-02 | 0.8121E-02 | 0.1243E-06 | 0.9509E-07 | 0.7653 | 7.0219 |
| 28 | H2AsO3- | 0.0100 | 0.0100 | 0.7644E-07 | 0.9016E-04 | 0.9018E-04 | 0.6888E-09 | 0.6427E-09 | 0.9331 | 9.1920 |
| 30 | F - | 1.2997 | 1.3000 | 0.6844E-04 | 0.1283E+01 | 0.1283E+01 | 0.6754E-04 | 0.6298E-04 | 0.9325 | 4.2008 |
| 31 | B(OH)3 | 1.7156 | 1.7160 | 0.2776E-04 | 0.1696E+01 | 0.1696E+01 | 0.2744E-04 | 0.2746E-04 | 1.0008 | 4.5613 |
| 34 | AlF ++ | | | | 0.2143E-03 | 0.2143E-03 | 0.4662E-08 | 0.3557E-08 | 0.7629 | 8.4490 |
| 35 | AlF2 + | | | | 0.6046E-02 | 0.6048E-02 | 0.9309E-07 | 0.8702E-07 | 0.9349 | 7.0604 |
| 36 | AlF3 | | | | 0.5530E-02 | 0.5531E-02 | 0.6587E-07 | 0.6593E-07 | 1.0008 | 7.1809 |
| 37 | AlF4 - | | | | 0.1121E-03 | 0.1122E-03 | 0.1089E-08 | 0.1017E-08 | 0.9338 | 8.9926 |
| 38 | Al(OH)++ | | | | 0.5644E-04 | 0.5646E-04 | 0.1284E-08 | 0.9793E-09 | 0.7629 | 9.0091 |
| 39 | Al(OH)2+ | | | | 0.8372E-02 | 0.8374E-02 | 0.1373E-06 | 0.1284E-06 | 0.9349 | 6.8916 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 40 | Al(OH)4- | 0.1824E+00 | 0.1825E+00 | 0.1921E-05 | 0.1793E-05 | 0.9338 | 5.7463 |
| 49 | H3AsO3 | 0.9537E-02 | 0.9540E-02 | 0.7575E-07 | 0.7582E-07 | 1.0008 | 7.1202 |
| 51 | BaCO3 | 0.1839E-04 | 0.1840E-04 | 0.9323E-10 | 0.9331E-10 | 1.0008 | 10.0301 |
| 52 | BaHCO3 + | 0.1930E-02 | 0.1930E-02 | 0.9733E-08 | 0.9082E-08 | 0.9331 | 8.0418 |
| 53 | BaOH + | 0.9473E-08 | 0.9476E-08 | 0.6140E-13 | 0.5737E-13 | 0.9344 | 13.2413 |
| 55 | CaCO3 | 0.1129E+00 | 0.1129E+00 | 0.1128E-05 | 0.1129E-05 | 1.0008 | 5.9472 |
| 56 | CaHCO3 + | 0.1121E+01 | 0.1121E+01 | 0.1109E-04 | 0.1038E-04 | 0.9356 | 4.9839 |
| 57 | CaOH + | 0.3400E-04 | 0.3400E-04 | 0.5957E-09 | 0.5573E-09 | 0.9356 | 9.2539 |
| 71 | FeCl + | 0.8989E-03 | 0.8991E-03 | 0.9849E-08 | 0.9190E-08 | 0.9331 | 8.0367 |
| 72 | FeCl2 | 0.5065E-14 | 0.5066E-14 | 0.3997E-19 | 0.4000E-19 | 1.0008 | 19.3979 |
| 75 | FeOH + | 0.5089E-01 | 0.5090E-01 | 0.6987E-06 | 0.6529E-06 | 0.9344 | 6.1852 |
| 76 | Fe(OH)2 | 0.5715E-05 | 0.5716E-05 | 0.6362E-10 | 0.6367E-10 | 1.0008 | 10.1961 |
| 77 | FeOOH - | 0.4296E-06 | 0.4297E-06 | 0.4836E-11 | 0.4519E-11 | 0.9344 | 11.3450 |
| 89 | B(OH)4 - | 0.2512E-01 | 0.2513E-01 | 0.3187E-06 | 0.2968E-06 | 0.9313 | 6.5275 |
| 90 | H2SiO4-- | 0.1545E-04 | 0.1546E-04 | 0.1643E-09 | 0.1253E-09 | 0.7629 | 9.9019 |
| 91 | H3SiO4 - | 0.4030E+00 | 0.4031E+00 | 0.4238E-05 | 0.3955E-05 | 0.9331 | 5.4028 |
| 92 | HAsO3 -- | 0.7469E-09 | 0.7471E-09 | 0.5751E-14 | 0.4378E-14 | 0.7613 | 14.3587 |
| 96 | HF | 0.8712E-04 | 0.8715E-04 | 0.4356E-08 | 0.4360E-08 | 1.0008 | 8.3605 |
| 97 | H2CO3 | 0.2121E+02 | 0.2121E+02 | 0.3420E-03 | 0.3423E-03 | 1.0008 | 3.4656 |
| 98 | CO3 -- | 0.1865E+00 | 0.1865E+00 | 0.3109E-05 | 0.2361E-05 | 0.7593 | 5.6270 |
| 113 | KCl | 0.4478E-03 | 0.4479E-03 | 0.6009E-08 | 0.6014E-08 | 1.0008 | 8.2209 |
| 114 | KCO3 - | 0.5284E-03 | 0.5285E-03 | 0.5333E-08 | 0.4975E-08 | 0.9329 | 8.3032 |
| 120 | MgCO3 | 0.2269E-01 | 0.2270E-01 | 0.2692E-06 | 0.2694E-06 | 1.0008 | 6.5696 |
| 121 | MgHCO3 + | 0.3732E+00 | 0.3733E+00 | 0.4375E-05 | 0.4083E-05 | 0.9331 | 5.3891 |
| 122 | MgF + | 0.2128E-01 | 0.2128E-01 | 0.4915E-06 | 0.4589E-06 | 0.9338 | 6.3383 |
| 123 | MgOH + | 0.2906E-03 | 0.2907E-03 | 0.7037E-08 | 0.6587E-08 | 0.9362 | 8.1813 |
| 128 | MnCl + | 0.3077E-10 | 0.3078E-10 | 0.3405E-15 | 0.3178E-15 | 0.9331 | 15.4979 |
| 129 | MnCl2 | 0.2564E-10 | 0.2565E-10 | 0.2039E-15 | 0.2040E-15 | 1.0008 | 15.6903 |
| 130 | MnCl3 - | 0.2311E-12 | 0.2312E-12 | 0.1434E-17 | 0.1338E-17 | 0.9331 | 17.8737 |
| 131 | MnCl4 -- | 0.6803E-15 | 0.6805E-15 | 0.3459E-20 | 0.2634E-20 | 0.7613 | 20.5795 |
| 132 | MnHCO3 + | 0.2484E-01 | 0.2484E-01 | 0.2143E-06 | 0.1999E-06 | 0.9331 | 6.6991 |
| 135 | MnOH + | 0.1090E-03 | 0.1090E-03 | 0.1515E-08 | 0.1414E-08 | 0.9331 | 8.8496 |
| 137 | NaCl | 0.3202E-02 | 0.3203E-02 | 0.5481E-07 | 0.5486E-07 | 1.0008 | 7.2608 |
| 138 | NaCO3 - | 0.4620E-02 | 0.4621E-02 | 0.5568E-07 | 0.5206E-07 | 0.9349 | 7.2835 |
| 139 | NaHCO3 | 0.1935E+00 | 0.1935E+00 | 0.2304E-05 | 0.2306E-05 | 1.0008 | 5.6371 |
| 140 | Na2CO3 | 0.1068E-06 | 0.1068E-06 | 0.1008E-11 | 0.1008E-11 | 1.0008 | 11.9964 |
| 144 | NaF | 0.4912E-03 | 0.4913E-03 | 0.1170E-07 | 0.1171E-07 | 1.0008 | 7.9313 |
| 158 | ZnCl + | 0.5663E-05 | 0.5665E-05 | 0.5619E-10 | 0.5243E-10 | 0.9331 | 10.2804 |
| 159 | ZnCl2 | 0.3000E-08 | 0.3001E-08 | 0.2202E-13 | 0.2204E-13 | 1.0008 | 13.6568 |
| 160 | ZnCl3 - | 0.6158E-12 | 0.6160E-12 | 0.3587E-17 | 0.3347E-17 | 0.9331 | 17.4753 |
| 161 | ZnCl4 -- | 0.1120E-15 | 0.1120E-15 | 0.5407E-21 | 0.4117E-21 | 0.7613 | 21.3855 |
| 163 | AlF5 -- | 0.2374E-06 | 0.2374E-06 | 0.1947E-11 | 0.1482E-11 | 0.7613 | 11.8291 |
| 164 | AlF6 -3 | 0.7597E-10 | 0.7599E-10 | 0.5391E-15 | 0.2951E-15 | 0.5475 | 15.5300 |
| 282 | CaCl2 | 0.3598E-06 | 0.3599E-06 | 0.3243E-11 | 0.3246E-11 | 1.0008 | 11.4886 |
| 284 | SiF6 -- | 0.2590E-21 | 0.2590E-21 | 0.1823E-26 | 0.1388E-26 | 0.7613 | 26.8576 |
| 292 | ZnHCO3 + | 0.9151E-03 | 0.9153E-03 | 0.7243E-08 | 0.6759E-08 | 0.9331 | 8.1701 |
| 293 | ZnOH + | 0.1271E-03 | 0.1271E-03 | 0.1544E-08 | 0.1440E-08 | 0.9331 | 8.8415 |
| 294 | Zn(OH)2 | 0.9605E-06 | 0.9607E-06 | 0.9668E-11 | 0.9676E-11 | 1.0008 | 11.0143 |

## LIST OF MINERALS AND THE SATURATION STATE

| | PHASE | LOG (AP) | LOG (KT) | LOG (AP/KT) | DELG | | PHASE | LOG (AP) | LOG (KT) | LOG (AP/KT) | DELG |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | ADULARIA | 5.893 | 1.421 | 4.473 | 5.995 | 71 | MgCl2 | -11.059 | 22.630 | -33.689 | -45.159 |
| 2 | AKERMANI | 27.322 | 46.379 | -19.056 | -25.544 | 72 | MARIALIT | 14.060 | 2.188 | 11.872 | 15.913 |
| 3 | ALBITE | 6.817 | 2.692 | 4.126 | 5.530 | 73 | MERWINIT | 38.421 | 69.520 | -31.099 | -41.686 |
| 4 | ALBITE L | 6.817 | 3.282 | 3.535 | 4.739 | 74 | MICROCLN | 5.893 | -0.464 | 6.358 | 8.522 |
| 5 | ALBITE H | 6.817 | 4.636 | 2.181 | 2.924 | 75 | MIEONITE | 71.605 | 72.769 | -1.164 | -1.560 |
| 7 | AMESI14A | 40.004 | 39.821 | 0.183 | 0.245 | 77 | MONTICEL | 19.012 | 30.769 | -11.757 | -15.760 |
| 8 | ANALCIME | 9.606 | 6.305 | 3.300 | 4.424 | 78 | MORD, Na | 1.241 | -3.894 | 5.135 | 6.884 |
| 9 | ANDALUSI | 18.601 | 17.269 | 1.332 | 1.785 | 79 | MORD, K | 0.317 | -7.676 | 7.993 | 10.714 |
| 10 | ANDESITE | 14.855 | 13.202 | 1.653 | 2.215 | 80 | MUSCOVIT | 27.282 | 13.592 | 13.690 | 18.351 |
| 12 | ANNITE | 38.223 | 29.959 | 8.264 | 11.078 | 81 | NACHOLIT | -5.359 | -0.487 | -4.872 | -6.530 |
| 13 | ANORTHIT | 26.911 | 26.750 | 0.162 | 0.217 | 82 | NATRTHRM | -11.252 | 0.019 | -11.271 | -15.108 |
| 17 | ARAGONIT | -9.128 | -8.308 | -0.820 | -1.099 | 83 | NATRON | -11.252 | -1.085 | -10.168 | -13.629 |
| 18 | AUGITE | 29.699 | 33.600 | -3.901 | -5.229 | 84 | NEPHALIN | 12.394 | 13.931 | -1.537 | -2.060 |
| 21 | BOEHMITE | 10.694 | 7.287 | 3.408 | 4.568 | 85 | NESQUHON | -9.526 | -5.239 | -4.286 | -5.746 |
| 22 | BRUCITE | -17.634 | -11.472 | -6.163 | -8.261 | 92 | OLIGOCLA | 10.836 | 9.066 | 1.771 | 2.373 |
| 23 | BYTOWNIT | 22.892 | 19.304 | 3.589 | 4.811 | 93 | PARAGONI | 28.206 | 15.177 | 13.029 | 17.465 |
| 24 | CALCITE | -9.128 | -8.453 | -0.675 | -0.905 | 94 | PARAGASI | 84.845 | 103.520 | -18.675 | -25.033 |
| 26 | CHALCEDO | -2.788 | -3.817 | 1.029 | 1.379 | 95 | PERICLAS | 10.702 | 21.981 | -11.279 | -15.119 |
| 27 | CHAM, 7A | 40.154 | 30.071 | 10.083 | 13.515 | 96 | PHILLIPS | 6.355 | 3.300 | 3.055 | 4.096 |
| 28 | CHLOR, 7 | 66.532 | 73.879 | -7.347 | -9.848 | 97 | PHLOGPIT | 37.998 | 38.189 | -0.191 | -0.256 |
| 29 | CHLOR, 1 | 66.532 | 70.484 | -3.952 | -5.298 | 98 | PHLOGPTF | 14.997 | 17.496 | -2.500 | -3.351 |
| 30 | CRYSOTIL | 26.528 | 32.743 | -6.215 | -8.331 | 99 | PORTLAN | -17.237 | -5.372 | -11.865 | -15.904 |
| 31 | C-ENSTAT | 7.913 | 11.557 | -3.644 | -4.884 | 100 | POTASSI | 7.127 | 85.450 | -78.322 | -104.987 |
| 32 | C-PTIL,N | 2.482 | -7.904 | 10.385 | 13.921 | 101 | PREHNITE | 35.222 | 32.974 | 2.247 | 3.012 |
| 33 | C-PTIL,K | 0.634 | -15.149 | 15.783 | 21.156 | 102 | PYROPHYL | 10.236 | 0.222 | 10.014 | 13.423 |
| 34 | C-PTIL,C | 4.605 | -9.263 | 13.868 | 18.589 | 103 | QUARTZ | -2.788 | -3.994 | 1.206 | 1.616 |
| 35 | C-PTIL,M | 4.208 | -4.847 | 9.055 | 12.138 | 104 | SANIDINE | 5.893 | 1.303 | 4.591 | 6.154 |
| 36 | CORUNDUM | 21.389 | 22.211 | -0.822 | -1.102 | 105 | SAPO, Na | 26.882 | 27.542 | -0.660 | -0.884 |
| 37 | CRISTOBA | -2.788 | -3.596 | 0.807 | 1.082 | 106 | SAPO, K | 26.577 | 27.196 | -0.619 | -0.829 |
| 38 | CRISTOBB | -2.788 | -2.979 | 0.191 | 0.255 | 107 | SAPO, H | 25.401 | 26.415 | -1.014 | -1.359 |
| 39 | DICKITE | 15.812 | 6.595 | 9.218 | 12.356 | 108 | SAPO, Ca | 27.232 | 27.502 | -0.269 | -0.361 |
| 40 | DIOPSIDE | 16.224 | 20.041 | -3.817 | -5.117 | 109 | SAPO, Mg | 27.167 | 27.490 | -0.323 | -0.433 |
| 41 | DOLOMITE | -18.654 | -17.966 | -0.687 | -0.921 | 110 | SEPIOLIT | 26.077 | 32.151 | -6.074 | -8.142 |
| 42 | DSORD | -18.654 | -16.389 | -2.265 | -3.036 | 111 | SILICAAM | -2.788 | -2.738 | -0.050 | -0.067 |
| 43 | ENSTATIT | 7.913 | 11.739 | -3.825 | -5.128 | 112 | SILICGEL | -2.788 | -2.754 | -0.034 | -0.046 |
| 45 | FAYALITE | 18.765 | 19.919 | -1.154 | -1.547 | 113 | SILLIMAN | 18.601 | 16.443 | 2.158 | 2.892 |
| 46 | FLUORITE | -11.903 | -11.023 | -0.880 | -1.180 | 114 | SMEC Ca | 16.510 | 6.713 | 9.796 | 13.131 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 47 | FORSTERI | 18.615 | 29.740 | -11.126 | -14.913 | 115 | SMEC K | 15.861 | 6.398 | 9.463 | 12.685 |
| 48 | GIBBS AM | -31.809 | -34.687 | 2.878 | 3.857 | 116 | SMEC Mg | 16.443 | 6.620 | 9.823 | 13.167 |
| 49 | GIBBSITE | -31.809 | -35.233 | 3.424 | 4.589 | 117 | SMEC Na | 16.166 | 6.672 | 9.494 | 12.726 |
| 50 | GREENALI | 26.753 | 23.114 | 3.639 | 4.878 | 118 | Na2O | 8.975 | 68.524 | -59.549 | -79.822 |
| 52 | HALITE | -6.393 | 1.577 | -7.970 | -10.683 | 119 | SPINEL | 32.090 | 37.625 | -5.534 | -7.418 |
| 53 | HALLOYSI | 15.812 | 9.387 | 6.426 | 8.613 | 120 | STILBITE | 12.970 | 1.749 | 11.221 | 15.041 |
| 54 | HEULANDI | 12.970 | 1.749 | 11.221 | 15.041 | 123 | SYLVITE | -7.317 | 0.855 | -8.171 | -10.953 |
| 55 | HUNTITE | -37.704 | -30.248 | -7.456 | -9.995 | 124 | TALC | 20.952 | 21.633 | -0.682 | -0.914 |
| 56 | HYDRMAGN | -50.109 | -38.148 | -11.961 | -16.032 | 126 | TREMOLIT | 53.399 | 62.225 | -8.826 | -11.830 |
| 57 | HYPHILIT | -10.662 | 12.050 | -22.712 | -30.445 | 127 | TRONA | -16.611 | -0.515 | -16.096 | -21.576 |
| 58 | ILLITE | 19.652 | 10.948 | 8.704 | 11.667 | 129 | WAIRAKIT | 21.335 | 18.068 | 3.267 | 4.379 |
| 59 | KAOLINIT | 15.812 | 6.684 | 9.129 | 12.237 | 130 | WITHERIT | -12.509 | -8.647 | -3.862 | -5.177 |
| 60 | KENYAITE | -26.183 | -25.000 | -1.183 | -1.586 | 131 | WOLLASTO | 8.310 | 12.789 | -4.478 | -6.003 |
| 61 | K-SPAR | 5.893 | -0.464 | 6.357 | 8.522 | 132 | ZOISITE | 45.916 | 43.490 | 2.426 | 3.252 |
| 62 | KYANITE | 18.601 | 15.134 | 3.466 | 4.646 | 144 | FeCl2 | -10.984 | 8.147 | -19.131 | -25.644 |
| 63 | LABRADOR | 20.334 | 16.726 | 3.608 | 4.836 | 146 | FeCO3 | -9.450 | -10.489 | 1.039 | 1.393 |
| 64 | LARNITE | 19.409 | 39.603 | -20.194 | -27.069 | 147 | FeO | 10.777 | 13.805 | -3.029 | -4.060 |
| 65 | LAUMONTI | 21.335 | 14.742 | 6.592 | 8.837 | 163 | MnCl2 | -12.572 | 9.014 | -21.586 | -28.935 |
| 66 | LEUCITE | 8.682 | 6.765 | 1.916 | 2.569 | 164 | MnCO3 | -11.039 | -10.522 | -0.516 | -0.692 |
| 67 | LIME | -18.101 | 33.262 | -51.364 | -68.850 | 165 | MnO | 9.188 | 18.073 | -8.885 | -11.910 |
| 68 | MAGADITE | -15.030 | -14.340 | -0.690 | -0.925 | 174 | ZnCO3 | -12.649 | -9.703 | -2.946 | -3.949 |
| 70 | MAGNESIT | -9.525 | -7.953 | -1.573 | -2.108 | 175 | ZnO | 7.578 | 11.534 | -3.956 | -5.302 |