

INVENTORY OF TRACE ELEMENTS IN WATER MATRIX REFERENCE MATERIALS

| Measurand | TM-07 lot 0425 | TM-9.3 lot 1025 | TM-15.4 lot 0425 | TM-23.6 lot 1025 | TM-24.5 lot 1025 | TM-25.7 lot 0425 | TM-26.5 lot 1025 | TM-27.5 lot 1025 |
|------------|-------------------|--------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| | Value in µg/L | Value in µg/L | Value in µg/L | Value in µg/L | Value in µg/L | Value in µg/L | Value in µg/L | Value in µg/L |
| Aluminum | 67.4 ± 7.3 | 33.6 ± 4.0 | 89.6 ± 9.9 | 96.1 ± 9.0 | 33.3 ± 4.6 | 29.5 ± 4.0 | | 91.3 ± 9.0 |
| Antimony | 2.21 ± 0.19 | 4.55 ± 0.42 | 16.5 ± 1.3 | 3.54 ± 0.32 | 3.45 ± 0.35 | 23.5 ± 2.4 | 2.92 ± 0.26 | 1.71 ± 0.20 |
| Arsenic | 10.5 ± 0.8 | 20.8 ± 1.9 | 16.5 ± 1.4 | 8.20 ± 0.65 | 5.73 ± 0.53 | 27.8 ± 2.3 | 9.07 ± 0.77 | 2.25 ± 0.20 |
| Barium | 28.3 ± 1.9 | 56.2 ± 3.9 | 29.0 ± 2.3 | 16.3 ± 1.2 | 14.9 ± 1.1 | 41.2 ± 3.4 | 26.7 ± 1.7 | 16.1 ± 1.3 |
| Beryllium | 3.08 ± 0.36 | 6.00 ± 0.62 | 16.1 ± 1.9 | 1.99 ± 0.21 | 2.08 ± 0.23 | 26.8 ± 3.2 | 3.50 ± 0.33 | |
| Bismuth | | | | 3.21 ± 0.44 | | 18.8 ± 2.6 | 2.92 ± 0.41 | |
| Boron | 15.8 ± 2.2 | 27.5 ± 4.8 | | 17.3 ± 3.0 | 16.0 ± 3.1 | | 47.0 ± 7.1 | |
| Cadmium | 1.92 ± 0.14 | 4.99 ± 0.34 | 12.9 ± 1.1 | 3.06 ± 0.20 | 3.93 ± 0.29 | 23.3 ± 1.7 | 7.13 ± 0.45 | 1.02 ± 0.10 |
| Chromium | 1.98 ± 0.19 | 3.94 ± 0.33 | 16.5 ± 1.1 | 7.09 ± 0.51 | 4.95 ± 0.36 | 23.6 ± 1.5 | 12.3 ± 0.8 | 1.79 ± 0.19 |
| Cobalt | 0.984 ± 0.088 | 1.99 ± 0.13 | 14.9 ± 1.0 | 7.27 ± 0.50 | 5.88 ± 0.36 | 27.0 ± 1.9 | 8.13 ± 0.48 | 2.51 ± 0.19 |
| Copper | 15.8 ± 1.5 | 32.6 ± 2.3 | 16.2 ± 1.3 | 8.21 ± 0.90 | 6.28 ± 0.57 | 25.2 ± 2.0 | 14.1 ± 1.1 | 4.77 ± 0.64 |
| Gallium | 1.44 ± 0.14 | 2.82 ± 0.20 | 0.148 ± 0.034 | 0.703 ± 0.067 | 3.23 ± 0.21 | 0.112 ± 0.025 | 5.47 ± 0.32 | |
| Iron | 56.0 ± 5.5 | 108 ± 10 | 25.9 ± 2.8 | 15.7 ± 2.3 | 16.1 ± 2.1 | 31.3 ± 4.0 | 21.6 ± 2.7 | 9.98 ± 1.65 |
| Lead | 4.04 ± 0.33 | 8.41 ± 0.76 | 11.0 ± 0.9 | 2.91 ± 0.29 | 5.33 ± 0.52 | 26.0 ± 2.9 | 10.2 ± 0.9 | 2.77 ± 0.30 |
| Lithium | 2.06 ± 0.31 | 4.27 ± 0.51 | 15.4 ± 1.8 | 10.2 ± 1.2 | 5.04 ± 0.47 | 24.4 ± 2.6 | 5.05 ± 0.51 | |
| Manganese | 4.93 ± 0.41 | 9.94 ± 0.71 | 17.7 ± 1.2 | 8.32 ± 0.64 | 8.45 ± 0.63 | 25.1 ± 1.8 | 11.0 ± 0.8 | 2.24 ± 0.23 |
| Molybdenum | 6.30 ± 0.71 | 12.8 ± 1.0 | 14.4 ± 1.4 | | | 26.9 ± 2.2 | 7.95 ± 0.66 | |
| Nickel | 9.30 ± 0.72 | 18.7 ± 1.2 | 16.8 ± 1.4 | 4.90 ± 0.47 | 4.93 ± 0.42 | 15.6 ± 1.3 | 11.0 ± 0.8 | 1.99 ± 0.22 |
| Rubidium | 2.21 ± 0.15 | 4.43 ± 0.31 | 0.742 ± 0.075 | 0.751 ± 0.068 | 3.68 ± 0.25 | 18.7 ± 1.1 | 10.6 ± 0.6 | 1.00 ± 0.08 |
| Selenium | 7.92 ± 0.81 | 16.2 ± 1.5 | 14.9 ± 1.7 | 5.03 ± 0.61 | 3.64 ± 0.46 | 29.1 ± 3.2 | 5.64 ± 0.63 | 1.36 ± 0.21 |
| Silver | 1.92 ± 0.20 | | 10.9 ± 0.8 | | 7.99 ± 0.57 | | 6.85 ± 0.55 | |
| Strontium | 114 ± 9 | 115 ± 9 | 111 ± 8 | 114 ± 9 | 115 ± 8 | 74.2 ± 5.2 | 119 ± 9 | |
| Thallium | 1.01 ± 0.08 | 1.99 ± 0.16 | 18.1 ± 1.3 | 4.21 ± 0.43 | 4.12 ± 0.34 | 31.7 ± 2.6 | 5.44 ± 0.45 | 1.48 ± 0.17 |
| Tin | | 2.92 ± 0.25 | | | 3.65 ± 0.34 | 23.7 ± 2.3 | 5.90 ± 0.49 | 2.29 ± 0.19 |
| Titanium | 3.86 ± 0.35 | 8.05 ± 0.61 | 14.6 ± 1.1 | 3.27 ± 0.30 | 7.17 ± 0.52 | 24.8 ± 2.2 | 6.28 ± 0.56 | 1.95 ± 0.27 |
| Tungsten | | | | | | | 3.56 ± 0.3 | |
| Uranium | 0.958 ± 0.081 | 1.83 ± 0.17 | 14.9 ± 1.1 | 4.95 ± 0.38 | 4.21 ± 0.29 | 26.3 ± 2.4 | 7.33 ± 0.52 | 1.94 ± 0.18 |
| Vanadium | 1.59 ± 0.22 | 3.00 ± 0.30 | 13.9 ± 1.0 | 1.91 ± 0.24 | 7.16 ± 0.55 | 27.3 ± 1.9 | 13.5 ± 0.9 | 2.16 ± 0.25 |
| Zinc | 28.3 ± 3.0 | 50.5 ± 4.9 | 38.0 ± 4.3 | 6.90 ± 1.15 | | 45.6 ± 5.6 | | |

*denotes a measurand which was removed from the previous lot #

*denotes a new lot #, new RM or newly added measurand

| Measurand | TM-40.1 lot 0524 | TMDA-51.6 lot 1025 | TMDA-52.5 lot 0425 | TMDA-54.6 lot 1025 | TMDA-61.4 lot 1025 | TMDA-62.3 lot 1024 | TMDA-64.4 lot 1024 | TMDA-70.3 lot 1024 |
|------------|---------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| | Value in µg/L | Value in µg/L | Value in µg/L | Value in µg/L | Value in µg/L | Value in µg/L | Value in µg/L | Value in µg/L |
| Aluminum | 40.8 ± 4.6 | 104 ± 11 | 307 ± 30 | 390 ± 30 | 60.2 ± 7.1 | 117 ± 9 | 289 ± 24 | 419 ± 37 |
| Antimony | 39.7 ± 4.2 | 15.3 ± 1.3 | 16.3 ± 1.3 | 27.6 ± 2.5 | 34.5 ± 3.0 | 60.1 ± 4.6 | 123 ± 10 | 23.4 ± 2.1 |
| Arsenic | 40.5 ± 3.7 | 18.1 ± 1.6 | 25.1 ± 1.9 | 45.1 ± 3.3 | 35.5 ± 2.9 | 57.4 ± 4.7 | 167 ± 15 | 48.4 ± 4.2 |
| Barium | 48.9 ± 3.2 | 72.4 ± 4.7 | 138 ± 9 | 324 ± 22 | 63.9 ± 4.7 | 115 ± 7 | 284 ± 18 | 317 ± 19 |
| Beryllium | 47.5 ± 4.7 | 10.2 ± 1.2 | 16.9 ± 1.8 | 17.2 ± 1.6 | 37.6 ± 4.8 | 54.5 ± 4.9 | 157 ± 17 | 16.4 ± 1.6 |
| Bismuth | 31.4 ± 6.9 | 9.43 ± 1.23 | 10.3 ± 1.5 | | 19.4 ± 2.2 | | 112 ± 12 | 12.6 ± 1.7 |
| Boron | 48.3 ± 6.1 | 47.5 ± 6.2 | 12.3 ± 2.1 | | 45.5 ± 5.6 | 114 ± 13 | | 39.2 ± 4.9 |
| Cadmium | 42.8 ± 3.3 | 25.5 ± 1.4 | 83.3 ± 5.3 | 156 ± 9 | 58.2 ± 3.8 | 92.0 ± 5.0 | 256 ± 14 | 138 ± 8 |
| Chromium | 39.3 ± 2.6 | 63.6 ± 4.2 | 156 ± 10 | 420 ± 27 | 68.0 ± 4.1 | 90.9 ± 5.5 | 273 ± 18 | 389 ± 26 |
| Cobalt | 41.4 ± 3.1 | 56.5 ± 4.1 | 124 ± 9 | 304 ± 21 | 62.3 ± 3.4 | 92.2 ± 6.6 | 252 ± 16 | 280 ± 19 |
| Copper | 45.9 ± 3.6 | 74.6 ± 5.4 | 178 ± 12 | 394 ± 29 | 57.7 ± 4.2 | 87.2 ± 5.7 | 251 ± 16 | 389 ± 29 |
| Gallium | | 9.89 ± 0.88 | 13.6 ± 1.1 | 12.5 ± 0.9 | 8.48 ± 0.65 | 32.1 ± 1.6 | 49.4 ± 3.2 | |
| Iron | 81.2 ± 6.7 | 107 ± 10 | 333 ± 23 | 369 ± 24 | 77.9 ± 5.8 | 113 ± 8 | 292 ± 21 | 369 ± 26 |
| Lead | 35.6 ± 2.7 | 60.7 ± 4.2 | 331 ± 26 | 491 ± 38 | 54.6 ± 3.6 | 94.1 ± 6.4 | 277 ± 21 | 440 ± 35 |
| Lithium | 37.4 ± 3.4 | 19.4 ± 2.4 | 14.7 ± 1.8 | 21.4 ± 1.9 | 34.9 ± 4.5 | 57.8 ± 6.5 | | |
| Manganese | 42.7 ± 2.9 | 79.6 ± 5.7 | 191 ± 12 | 274 ± 16 | 74.9 ± 4.9 | 91.6 ± 5.9 | 288 ± 17 | 312 ± 20 |
| Molybdenum | 42.6 ± 2.9 | 55.3 ± 4.7 | 196 ± 13 | 293 ± 22 | 72.9 ± 5.3 | 98.6 ± 6.4 | 281 ± 21 | 261 ± 19 |
| Nickel | 43.1 ± 3.3 | 63.7 ± 4.7 | 260 ± 19 | 323 ± 21 | 55.4 ± 3.9 | 92.7 ± 6.3 | 246 ± 15 | 326 ± 22 |
| Rubidium | 1.45 ± 0.11 | 16.1 ± 0.9 | 15.7 ± 1.0 | 14.2 ± 0.9 | 3.30 ± 0.21 | 15.7 ± 0.9 | 29.1 ± 1.7 | 0.663 ± 0.084 |
| Selenium | 41.7 ± 4.9 | 14.6 ± 1.6 | 22.4 ± 1.9 | 34.8 ± 3.5 | 39.5 ± 3.7 | 53.1 ± 4.5 | 158 ± 13 | 28.6 ± 2.5 |
| Silver | 21.3 ± 2.2 | 11.1 ± 0.9 | | 12.9 ± 1.0 | | | | 8.56 ± 0.66 |
| Strontium | 69.7 ± 4.8 | 113 ± 9 | 271 ± 17 | 574 ± 40 | 113 ± 8 | 145 ± 10 | 622 ± 44 | 445 ± 29 |
| Thallium | 44.6 ± 3.4 | 18.3 ± 1.3 | 18.0 ± 1.2 | 28.3 ± 2.1 | 37.9 ± 2.5 | 51.0 ± 3.4 | 144 ± 10 | 21.4 ± 1.44 |
| Tin | 38.5 ± 3.1 | 16.2 ± 1.2 | 18.9 ± 1.4 | 45.4 ± 3.0 | 56.8 ± 4.6 | 105 ± 8 | 281 ± 24 | |
| Titanium | | 13.9 ± 1.1 | 110 ± 9 | 32.8 ± 2.6 | 36.8 ± 2.6 | 56.7 ± 3.5 | 121 ± 8 | |
| Tungsten | | | 9.88 ± 1.00 | 8.54 ± 1.00 | 0.352 ± 0.046 | 1.03 ± 0.20 | | |
| Uranium | 39.5 ± 2.6 | 28.6 ± 1.9 | 21.6 ± 1.4 | 56.7 ± 4.1 | 35.1 ± 2.7 | 54.2 ± 3.6 | 132 ± 11 | 60.0 ± 3.8 |
| Vanadium | 42 ± 3.0 | 46.9 ± 3.8 | 135 ± 9 | 341 ± 24 | 70.8 ± 6.0 | 112 ± 7 | 280 ± 19 | 313 ± 20 |
| Zinc | 100 ± 10 | 142 ± 12 | 273 ± 25 | 540 ± 37 | 74.8 ± 6.6 | 121 ± 11 | 329 ± 25 | 502 ± 40 |

All values are in µg/L, unless otherwise specified.

October 30, 2025