

### X-Ray Fluorescence (Based on SW-846 Method 6200)

| Analyte         | Matrix | Detection Limit <sup>1</sup><br>(mg/kg) | Samples per Day <sup>2</sup> | Interferences | Performance Tips and Limitations                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                          |
|-----------------|--------|-----------------------------------------|------------------------------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Antimony        | Soil   | 40                                      | 30-50 <sup>3</sup>           |               | Count time will affect detection limits and accuracy.                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                          |
|                 | Water  | 1.3                                     |                              |               |                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                          |
| Arsenic         | Soil   | 40                                      |                              | Pb            | Moisture content can affect the results of the measurement. It is recommended that the sample be dried in a convection (not microwave) type oven.                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                          |
|                 | Water  | 0.04                                    |                              | Pb            |                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                          |
| Barium          | Soil   | 20                                      |                              |               |                                                                                                                                                                                                                                                                                                                                                                                                                       | Sample preparation such as sieving or not sieving, grinding or not grinding will affect the results of the analysis. The closer the sample texture is to the standard texture the more accurate the measurement will be. |
|                 | Water  | 0.08                                    |                              |               |                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                          |
| Cadmium         | Soil   | 100                                     |                              |               | Ambient temperature changes will affect the gain on the instrument. Most instruments will automatically adjust their gain. However the operator should check to see if the instrument being used has this feature.                                                                                                                                                                                                    |                                                                                                                                                                                                                          |
|                 | Water  | 0.24                                    |                              |               |                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                          |
| Calcium         | Soil   | 70                                      |                              | Fe, Vn        | XRF measures total metal. If the project is using an offsite laboratory for confirmatory and/or comparison purposes, a sample preparation step employing a total digestion should be specified for the offsite laboratory. Also, it is recommended that the soil sample that was actually analyzed by the XRF, not a split, be sent to the confirmatory laboratory to help mitigate potential heterogeneity problems. |                                                                                                                                                                                                                          |
|                 | Water  | 0.03                                    |                              | Fe, Vn        |                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                          |
| Chromium, total | Soil   | 150                                     |                              | Fe            |                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                          |
|                 | Water  | 0.03                                    |                              | Fe            |                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                          |
| Cobalt          | Soil   | 60                                      |                              | Fe            |                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                          |
|                 | Water  | 0.03                                    |                              | Fe            |                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                          |
| Copper          | Soil   | 50                                      |                              | Fe            |                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                          |
|                 | Water  | 0.03                                    |                              | Fe            |                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                          |
| Iron            | Soil   | 60                                      |                              |               |                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                          |
|                 | Water  | 0.03                                    |                              |               |                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                          |

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### X-Ray Fluorescence (Based on SW-846 Method 6200) (Continued)

| Analyte    | Matrix | Detection Limit <sup>1</sup><br>(mg/kg) | Samples per<br>Day <sup>2</sup> | Interferences | Performance Tips and Limitations                               |
|------------|--------|-----------------------------------------|---------------------------------|---------------|----------------------------------------------------------------|
| Lead       | Soil   | 20                                      |                                 |               | TDS levels will affect the detection limits for water samples. |
|            | Water  | 0.16                                    |                                 |               |                                                                |
| Manganese  | Soil   | 70                                      |                                 |               |                                                                |
|            | Water  | 0.03                                    |                                 |               |                                                                |
| Mercury    | Soil   | 30                                      |                                 | Zn            |                                                                |
| Molybdenum | Soil   | 10                                      |                                 |               |                                                                |
|            | Water  | 0.04                                    |                                 |               |                                                                |
| Nickel     | Soil   | 50                                      |                                 |               |                                                                |
|            | Water  | 0.03                                    |                                 |               |                                                                |
| Potassium  | Soil   | 200                                     |                                 |               |                                                                |
|            | Water  | 0.07                                    |                                 |               |                                                                |
| Rubidium   | Soil   | 10                                      |                                 |               |                                                                |
|            | Water  | 0.07                                    |                                 |               |                                                                |
| Selenium   | Soil   | 40                                      |                                 |               |                                                                |
|            | Water  | 0.12                                    |                                 |               |                                                                |
| Silver     | Soil   | 70                                      |                                 |               |                                                                |
|            | Water  | 0.60                                    |                                 |               |                                                                |
| Strontium  | Soil   | 10                                      |                                 |               |                                                                |
|            | Water  | 0.04                                    |                                 |               |                                                                |

| <b>X-Ray Fluorescence (Based on SW-846 Method 6200) (Continued)</b> |               |                                                |                                        |                      |                                         |
|---------------------------------------------------------------------|---------------|------------------------------------------------|----------------------------------------|----------------------|-----------------------------------------|
| <b>Analyte</b>                                                      | <b>Matrix</b> | <b>Detection Limit<sup>1</sup><br/>(mg/kg)</b> | <b>Samples per<br/>Day<sup>2</sup></b> | <b>Interferences</b> | <b>Performance Tips and Limitations</b> |
| Thallium                                                            | Soil          | 20                                             |                                        |                      |                                         |
|                                                                     | Water         | 0.06                                           |                                        |                      |                                         |
| Thorium                                                             | Soil          | 10                                             |                                        |                      |                                         |
| Tin                                                                 | Soil          | 60                                             |                                        |                      |                                         |
|                                                                     | Water         | 0.3                                            |                                        |                      |                                         |
| Titanium                                                            | Soil          | 50                                             |                                        |                      |                                         |
|                                                                     | Water         |                                                |                                        |                      |                                         |
| Vanadium                                                            | Soil          | 50                                             |                                        |                      |                                         |
|                                                                     | Water         | 0.04                                           |                                        |                      |                                         |
| Zinc                                                                | Soil          | 50                                             |                                        |                      |                                         |
|                                                                     | Water         | 0.03                                           |                                        |                      |                                         |
| Zirconium                                                           | Soil          | 10                                             |                                        |                      |                                         |
|                                                                     | Water         |                                                |                                        |                      |                                         |

<sup>1</sup> Best achievable. Detection limits using this method for soils are very matrix specific. Actual detection limits may be considerably higher. Water detection limits are from the KevexSpectrace website.

<sup>2</sup> This will vary, depending on count time and the sample preparation method chosen. For example, the widest difference will be between direct in situ measurement and drying and grinding the sample before measurement.