## 9 Appendix A – Sediment

### 9.1.1 Sediment Data Tables

Table 9-1: Elemental concentrations of light coloured sediment samples from the WFS

<table>
<thead>
<tr>
<th>Element</th>
<th>Average</th>
<th>STDEV</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Co mg/kg</td>
<td>64.81</td>
<td>44.15</td>
<td>23.50</td>
<td>162.50</td>
</tr>
<tr>
<td>Ni mg/kg</td>
<td>526.88</td>
<td>398.19</td>
<td>170.00</td>
<td>1425.00</td>
</tr>
<tr>
<td>Cu mg/kg</td>
<td>15.91</td>
<td>7.24</td>
<td>5.00</td>
<td>25.00</td>
</tr>
<tr>
<td>Zn mg/kg</td>
<td>264.38</td>
<td>242.91</td>
<td>57.50</td>
<td>825.00</td>
</tr>
<tr>
<td>Se mg/kg</td>
<td>1.20</td>
<td>0.23</td>
<td>0.88</td>
<td>1.48</td>
</tr>
<tr>
<td>Cd mg/kg</td>
<td>0.12</td>
<td>0.08</td>
<td>0.05</td>
<td>0.30</td>
</tr>
<tr>
<td>Pb mg/kg</td>
<td>10.89</td>
<td>15.50</td>
<td>1.90</td>
<td>47.50</td>
</tr>
<tr>
<td>Au mg/kg</td>
<td>0.36</td>
<td>0.24</td>
<td>0.11</td>
<td>0.88</td>
</tr>
<tr>
<td>U mg/kg</td>
<td>7.61</td>
<td>3.57</td>
<td>1.63</td>
<td>10.75</td>
</tr>
<tr>
<td>V mg/kg</td>
<td>20.50</td>
<td>9.72</td>
<td>11.25</td>
<td>35.00</td>
</tr>
<tr>
<td>Cr mg/kg</td>
<td>87.50</td>
<td>50.80</td>
<td>37.50</td>
<td>187.50</td>
</tr>
<tr>
<td>Mn mg/kg</td>
<td>485.63</td>
<td>929.49</td>
<td>47.50</td>
<td>2750.00</td>
</tr>
<tr>
<td>Fe mg/kg</td>
<td>7562.50</td>
<td>4925.79</td>
<td>2750.00</td>
<td>14000.00</td>
</tr>
<tr>
<td>As mg/kg</td>
<td>4.38</td>
<td>2.06</td>
<td>2.18</td>
<td>7.00</td>
</tr>
<tr>
<td>Ba mg/kg</td>
<td>94.16</td>
<td>196.53</td>
<td>10.25</td>
<td>575.00</td>
</tr>
</tbody>
</table>
Table 9-2: Elemental concentration of dark coloured sediment samples from the WFS

<table>
<thead>
<tr>
<th>Element</th>
<th>Average</th>
<th>STDEV</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Co mg/kg</td>
<td>262.50</td>
<td>182.71</td>
<td>47.50</td>
<td>575.00</td>
</tr>
<tr>
<td>Ni mg/kg</td>
<td>2202.50</td>
<td>1751.56</td>
<td>525.00</td>
<td>5000.00</td>
</tr>
<tr>
<td>Cu mg/kg</td>
<td>79.18</td>
<td>65.50</td>
<td>8.50</td>
<td>197.50</td>
</tr>
<tr>
<td>Zn mg/kg</td>
<td>1335.00</td>
<td>1166.26</td>
<td>225.00</td>
<td>3500.00</td>
</tr>
<tr>
<td>Se mg/kg</td>
<td>0.92</td>
<td>0.71</td>
<td>0.12</td>
<td>2.20</td>
</tr>
<tr>
<td>Cd mg/kg</td>
<td>0.80</td>
<td>0.69</td>
<td>0.11</td>
<td>2.25</td>
</tr>
<tr>
<td>Pb mg/kg</td>
<td>15.74</td>
<td>10.02</td>
<td>0.85</td>
<td>35.00</td>
</tr>
<tr>
<td>Au mg/kg</td>
<td>2.77</td>
<td>2.23</td>
<td>0.45</td>
<td>6.25</td>
</tr>
<tr>
<td>U mg/kg</td>
<td>45.30</td>
<td>29.99</td>
<td>20.50</td>
<td>100.00</td>
</tr>
<tr>
<td>V mg/kg</td>
<td>22.09</td>
<td>12.84</td>
<td>2.10</td>
<td>47.50</td>
</tr>
<tr>
<td>Cr mg/kg</td>
<td>71.78</td>
<td>40.30</td>
<td>5.25</td>
<td>135.00</td>
</tr>
<tr>
<td>Mn mg/kg</td>
<td>391.75</td>
<td>232.05</td>
<td>42.50</td>
<td>875.00</td>
</tr>
<tr>
<td>Fe mg/kg</td>
<td>12292.50</td>
<td>8891.63</td>
<td>925.00</td>
<td>27500.00</td>
</tr>
<tr>
<td>As mg/kg</td>
<td>11.38</td>
<td>6.36</td>
<td>1.78</td>
<td>24.75</td>
</tr>
<tr>
<td>Ba mg/kg</td>
<td>198.20</td>
<td>423.63</td>
<td>24.50</td>
<td>1400.00</td>
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</table>

Table 9-3: Elemental concentrations of sediment samples from the MR

<table>
<thead>
<tr>
<th>Element</th>
<th>Average</th>
<th>STDEV</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Co mg/kg</td>
<td>16.04</td>
<td>14.89</td>
<td>1.18</td>
<td>40.00</td>
</tr>
<tr>
<td>Ni mg/kg</td>
<td>72.45</td>
<td>59.44</td>
<td>9.75</td>
<td>167.50</td>
</tr>
<tr>
<td>Cu mg/kg</td>
<td>22.05</td>
<td>15.87</td>
<td>5.00</td>
<td>47.50</td>
</tr>
<tr>
<td>Zn mg/kg</td>
<td>12.90</td>
<td>10.25</td>
<td>4.00</td>
<td>30.00</td>
</tr>
<tr>
<td>Se mg/kg</td>
<td>0.17</td>
<td>0.12</td>
<td>0.08</td>
<td>0.38</td>
</tr>
<tr>
<td>Cd mg/kg</td>
<td>0.04</td>
<td>0.05</td>
<td>0.00</td>
<td>0.11</td>
</tr>
<tr>
<td>Pb mg/kg</td>
<td>11.90</td>
<td>1.36</td>
<td>10.50</td>
<td>13.75</td>
</tr>
<tr>
<td>Au mg/kg</td>
<td>0.58</td>
<td>0.36</td>
<td>0.28</td>
<td>1.20</td>
</tr>
<tr>
<td>U mg/kg</td>
<td>0.12</td>
<td>0.13</td>
<td>0.01</td>
<td>0.33</td>
</tr>
<tr>
<td>V mg/kg</td>
<td>44.50</td>
<td>36.89</td>
<td>17.25</td>
<td>107.50</td>
</tr>
<tr>
<td>Cr mg/kg</td>
<td>123.50</td>
<td>43.39</td>
<td>72.50</td>
<td>175.00</td>
</tr>
<tr>
<td>Mn mg/kg</td>
<td>8616.50</td>
<td>9129.40</td>
<td>57.50</td>
<td>18500.00</td>
</tr>
<tr>
<td>Fe mg/kg</td>
<td>36100.00</td>
<td>42583.96</td>
<td>4250.00</td>
<td>110000.00</td>
</tr>
<tr>
<td>As mg/kg</td>
<td>11.33</td>
<td>15.00</td>
<td>0.73</td>
<td>37.50</td>
</tr>
<tr>
<td>Ba mg/kg</td>
<td>620.50</td>
<td>609.10</td>
<td>15.00</td>
<td>1350.00</td>
</tr>
</tbody>
</table>
9.1.2 Sediment Texture Tables

Table 9-4: Particle size distribution and texture classes of light coloured sediment samples from the WFS

<table>
<thead>
<tr>
<th>Sample no.</th>
<th>Sand</th>
<th>Silt</th>
<th>Clay</th>
<th>Texture</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>93.9</td>
<td>1.0</td>
<td>5.2</td>
<td>Sand</td>
</tr>
<tr>
<td>2</td>
<td>96.4</td>
<td>0.9</td>
<td>2.8</td>
<td>Sand</td>
</tr>
<tr>
<td>3</td>
<td>96.1</td>
<td>1.0</td>
<td>3.0</td>
<td>Sand</td>
</tr>
<tr>
<td>4</td>
<td>93.5</td>
<td>1.0</td>
<td>5.4</td>
<td>Sand</td>
</tr>
<tr>
<td>5</td>
<td>93.9</td>
<td>1.0</td>
<td>5.1</td>
<td>Sand</td>
</tr>
<tr>
<td>6</td>
<td>95.9</td>
<td>1.0</td>
<td>3.1</td>
<td>Sand</td>
</tr>
<tr>
<td>7</td>
<td>94.2</td>
<td>1.4</td>
<td>4.4</td>
<td>Sand</td>
</tr>
<tr>
<td>8</td>
<td>94.5</td>
<td>1.0</td>
<td>4.5</td>
<td>Sand</td>
</tr>
</tbody>
</table>

Table 9-5: Particle size distribution and texture classes of dark coloured sediment samples from the WFS

<table>
<thead>
<tr>
<th>Sample no.</th>
<th>Sand</th>
<th>Silt</th>
<th>Clay</th>
<th>Texture</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>66.5</td>
<td>20.4</td>
<td>13.1</td>
<td>Sandy loam</td>
</tr>
<tr>
<td>2</td>
<td>66.6</td>
<td>11.6</td>
<td>21.8</td>
<td>Sandy loam</td>
</tr>
<tr>
<td>3</td>
<td>65.3</td>
<td>22.1</td>
<td>12.6</td>
<td>Sandy loam</td>
</tr>
<tr>
<td>4</td>
<td>79.4</td>
<td>10.4</td>
<td>10.2</td>
<td>Loamy sand</td>
</tr>
<tr>
<td>5</td>
<td>87.6</td>
<td>6.2</td>
<td>6.1</td>
<td>Loamy sand</td>
</tr>
<tr>
<td>6</td>
<td>34.4</td>
<td>52.9</td>
<td>12.6</td>
<td>Silt loam</td>
</tr>
<tr>
<td>7</td>
<td>43.0</td>
<td>42.3</td>
<td>14.8</td>
<td>Loam</td>
</tr>
<tr>
<td>8</td>
<td>53.1</td>
<td>30.9</td>
<td>16.0</td>
<td>Sandy Loam</td>
</tr>
</tbody>
</table>

Table 9-6: Particle size distribution and texture classes of sediment samples from the Mooi River

<table>
<thead>
<tr>
<th>Sample no.</th>
<th>Sand</th>
<th>Silt</th>
<th>Clay</th>
<th>Texture</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>32</td>
<td>47.55</td>
<td>20.45</td>
<td>Loam</td>
</tr>
<tr>
<td>2</td>
<td>34.6</td>
<td>40.1</td>
<td>25.3</td>
<td>Loam</td>
</tr>
<tr>
<td>3</td>
<td>30.93</td>
<td>48.02</td>
<td>21.05</td>
<td>Loam</td>
</tr>
<tr>
<td>4</td>
<td>32.7</td>
<td>43.2</td>
<td>24.1</td>
<td>Loam</td>
</tr>
<tr>
<td>5</td>
<td>31.3</td>
<td>38.1</td>
<td>30.6</td>
<td>Clay loam</td>
</tr>
</tbody>
</table>
9.1.3 Identification of Elements of Interest

Figure 9-1: A comparison of cobalt, nickel and zinc concentrations. Light coloured sediment samples from the WFS in blue, dark coloured sediment samples from the WFS in red and the background sediment samples from the MR in green.

<table>
<thead>
<tr>
<th></th>
<th>Co</th>
<th>Ni</th>
<th>Zn</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light WFS</td>
<td>64.8125</td>
<td>526.875</td>
<td>264.375</td>
</tr>
<tr>
<td>Dark WFS</td>
<td>262.5</td>
<td>2202.5</td>
<td>1335</td>
</tr>
<tr>
<td>Mooi River</td>
<td>16.035</td>
<td>72.45</td>
<td>12.9</td>
</tr>
</tbody>
</table>

Figure 9-2: A comparison of selenium, cadmium and gold concentrations. Light coloured sediment samples from the WFS in blue, dark coloured sediment samples from the WFS in red and the background sediment samples from the MR in green.

<table>
<thead>
<tr>
<th></th>
<th>Se</th>
<th>Cd</th>
<th>Au</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light WFS</td>
<td>1.203125</td>
<td>0.1246875</td>
<td>0.363125</td>
</tr>
<tr>
<td>Dark WFS</td>
<td>0.91725</td>
<td>0.8</td>
<td>2.77</td>
</tr>
<tr>
<td>Mooi River</td>
<td>0.1685</td>
<td>0.04475</td>
<td>0.58</td>
</tr>
</tbody>
</table>
9.2 Comparison of the Elemental Concentrations within the different particle size fractions of Sediments Samples

Table 9-7: Sand sized fraction from sediment samples from the WFS

<table>
<thead>
<tr>
<th>Element</th>
<th>Average</th>
<th>STDEV</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Co mg/kg</td>
<td>37.19</td>
<td>12.86</td>
<td>23.98</td>
<td>56.40</td>
</tr>
<tr>
<td>Ni mg/kg</td>
<td>154.15</td>
<td>58.21</td>
<td>88.00</td>
<td>240.88</td>
</tr>
<tr>
<td>Cu mg/kg</td>
<td>14.78</td>
<td>4.18</td>
<td>7.61</td>
<td>18.01</td>
</tr>
<tr>
<td>Zn mg/kg</td>
<td>127.15</td>
<td>72.77</td>
<td>17.47</td>
<td>201.08</td>
</tr>
<tr>
<td>Se mg/kg</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Cd mg/kg</td>
<td>0.13</td>
<td>0.08</td>
<td>0.02</td>
<td>0.20</td>
</tr>
<tr>
<td>Pb mg/kg</td>
<td>12.23</td>
<td>12.79</td>
<td>2.04</td>
<td>30.00</td>
</tr>
<tr>
<td>Au mg/kg</td>
<td>1.06</td>
<td>0.58</td>
<td>0.39</td>
<td>1.78</td>
</tr>
<tr>
<td>U mg/kg</td>
<td>36.93</td>
<td>33.33</td>
<td>6.29</td>
<td>89.80</td>
</tr>
</tbody>
</table>
### Table 9-8: Silt sized fraction from sediment samples from the WFS

<table>
<thead>
<tr>
<th>Element</th>
<th>Average</th>
<th>STDEV</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Co mg/kg</td>
<td>51.55</td>
<td>35.14</td>
<td>14.55</td>
<td>109.33</td>
</tr>
<tr>
<td>Ni mg/kg</td>
<td>231.06</td>
<td>150.73</td>
<td>53.05</td>
<td>469.00</td>
</tr>
<tr>
<td>Cu mg/kg</td>
<td>18.63</td>
<td>6.82</td>
<td>9.07</td>
<td>25.73</td>
</tr>
<tr>
<td>Zn mg/kg</td>
<td>200.27</td>
<td>175.15</td>
<td>21.73</td>
<td>480.25</td>
</tr>
<tr>
<td>Se mg/kg</td>
<td>0.05</td>
<td>0.06</td>
<td>0.00</td>
<td>0.13</td>
</tr>
<tr>
<td>Cd mg/kg</td>
<td>0.14</td>
<td>0.12</td>
<td>0.03</td>
<td>0.30</td>
</tr>
<tr>
<td>Pb mg/kg</td>
<td>6.99</td>
<td>3.36</td>
<td>2.42</td>
<td>10.61</td>
</tr>
<tr>
<td>Au mg/kg</td>
<td>1.14</td>
<td>0.49</td>
<td>0.43</td>
<td>1.74</td>
</tr>
<tr>
<td>U mg/kg</td>
<td>54.46</td>
<td>39.85</td>
<td>5.92</td>
<td>103.00</td>
</tr>
</tbody>
</table>

### Table 9-9: Clay sized fraction from sediment samples from the WFS

<table>
<thead>
<tr>
<th>Element</th>
<th>Average</th>
<th>STDEV</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Co mg/kg</td>
<td>120.57</td>
<td>114.93</td>
<td>24.09</td>
<td>305.00</td>
</tr>
<tr>
<td>Ni mg/kg</td>
<td>547.46</td>
<td>502.22</td>
<td>100.40</td>
<td>1345.75</td>
</tr>
<tr>
<td>Cu mg/kg</td>
<td>38.39</td>
<td>13.44</td>
<td>23.80</td>
<td>56.38</td>
</tr>
<tr>
<td>Zn mg/kg</td>
<td>515.71</td>
<td>507.70</td>
<td>38.88</td>
<td>1313.25</td>
</tr>
<tr>
<td>Se mg/kg</td>
<td>0.52</td>
<td>0.25</td>
<td>0.30</td>
<td>0.81</td>
</tr>
<tr>
<td>Cd mg/kg</td>
<td>0.36</td>
<td>0.26</td>
<td>0.06</td>
<td>0.68</td>
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<tr>
<td>Pb mg/kg</td>
<td>16.02</td>
<td>2.72</td>
<td>12.21</td>
<td>19.02</td>
</tr>
<tr>
<td>Au mg/kg</td>
<td>2.18</td>
<td>0.54</td>
<td>1.44</td>
<td>2.87</td>
</tr>
<tr>
<td>U mg/kg</td>
<td>129.86</td>
<td>84.83</td>
<td>31.35</td>
<td>244.53</td>
</tr>
</tbody>
</table>

### Table 9-10: Particle size distribution of a sediment sample from the MR

<table>
<thead>
<tr>
<th>Element</th>
<th>Sand</th>
<th>Silt</th>
<th>Clay</th>
</tr>
</thead>
<tbody>
<tr>
<td>Co mg/kg</td>
<td>27.68</td>
<td>34.53</td>
<td>40.63</td>
</tr>
<tr>
<td>Ni mg/kg</td>
<td>56.05</td>
<td>80.50</td>
<td>96.40</td>
</tr>
<tr>
<td>Cu mg/kg</td>
<td>10.50</td>
<td>13.75</td>
<td>24.64</td>
</tr>
<tr>
<td>Zn mg/kg</td>
<td>8.35</td>
<td>11.28</td>
<td>15.53</td>
</tr>
<tr>
<td>Se mg/kg</td>
<td>0.00</td>
<td>0.06</td>
<td>0.21</td>
</tr>
<tr>
<td>Cd mg/kg</td>
<td>0.06</td>
<td>0.08</td>
<td>0.10</td>
</tr>
<tr>
<td>Pb mg/kg</td>
<td>5.65</td>
<td>9.02</td>
<td>11.67</td>
</tr>
<tr>
<td>Au mg/kg</td>
<td>0.23</td>
<td>0.22</td>
<td>0.23</td>
</tr>
<tr>
<td>U mg/kg</td>
<td>0.37</td>
<td>0.49</td>
<td>0.82</td>
</tr>
</tbody>
</table>
Figure 9-4: A comparison of the selenium, cadmium, gold, lead and copper concentrations in the different fractions (sand in blue, silt in red and clay in green) from the WFS sediment samples.

Figure 9-5: A comparison of the cobalt, nickel, uranium and zinc concentrations in the different fractions (sand in blue, silt in red and clay in green) from the WFS sediment samples.
Figure 9-6: A comparison of the cobalt, nickel, copper and zinc concentrations in the different fractions (sand in blue, silt in red and clay in green) from the MR sediment samples.

Figure 9-7: A comparison of the lead, cadmium, gold, uranium and selenium concentrations in the different fractions (sand in blue, silt in red and clay in green) from the MR sediment samples.
10 Appendix B - Water

10.1 Water Tables

Table 10-1: Elemental concentrations found in Mooi River water samples

<table>
<thead>
<tr>
<th>Element</th>
<th>Average</th>
<th>STDEV</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Co (mg/L)</td>
<td>0.00004</td>
<td>0.00002</td>
<td>0.00002</td>
<td>0.00006</td>
</tr>
<tr>
<td>Ni (mg/L)</td>
<td>0.00192</td>
<td>0.00004</td>
<td>0.00190</td>
<td>0.00200</td>
</tr>
<tr>
<td>Cu (mg/L)</td>
<td>0.00382</td>
<td>0.00011</td>
<td>0.00370</td>
<td>0.00390</td>
</tr>
<tr>
<td>Zn (mg/L)</td>
<td>0.00280</td>
<td>0.00080</td>
<td>0.00180</td>
<td>0.00390</td>
</tr>
<tr>
<td>Se (mg/L)</td>
<td>0.00688</td>
<td>0.00066</td>
<td>0.00580</td>
<td>0.00750</td>
</tr>
<tr>
<td>Cd (mg/L)</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
</tr>
<tr>
<td>Pb (mg/L)</td>
<td>0.00054</td>
<td>0.00003</td>
<td>0.00050</td>
<td>0.00057</td>
</tr>
<tr>
<td>U (mg/L)</td>
<td>0.00078</td>
<td>0.00001</td>
<td>0.00076</td>
<td>0.00080</td>
</tr>
</tbody>
</table>

Table 10-2: Elemental concentrations found in Wonderfonteinspruit water samples

<table>
<thead>
<tr>
<th>Element</th>
<th>Average</th>
<th>STDEV</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Co (mg/L)</td>
<td>0.02417</td>
<td>0.03232</td>
<td>0.00293</td>
<td>0.20000</td>
</tr>
<tr>
<td>Ni (mg/L)</td>
<td>0.12746</td>
<td>0.10979</td>
<td>0.00950</td>
<td>0.64000</td>
</tr>
<tr>
<td>Cu (mg/L)</td>
<td>0.10267</td>
<td>0.08926</td>
<td>0.00520</td>
<td>0.28604</td>
</tr>
<tr>
<td>Zn (mg/L)</td>
<td>0.10707</td>
<td>0.10161</td>
<td>0.00520</td>
<td>0.44299</td>
</tr>
<tr>
<td>Se (mg/L)</td>
<td>0.06253</td>
<td>0.02315</td>
<td>0.03400</td>
<td>0.10733</td>
</tr>
<tr>
<td>Cd (mg/L)</td>
<td>0.00184</td>
<td>0.00441</td>
<td>0.00040</td>
<td>0.02438</td>
</tr>
<tr>
<td>Pb (mg/L)</td>
<td>0.00509</td>
<td>0.00583</td>
<td>0.00150</td>
<td>0.02440</td>
</tr>
<tr>
<td>U (mg/L)</td>
<td>0.05704</td>
<td>0.04302</td>
<td>0.01593</td>
<td>0.23358</td>
</tr>
</tbody>
</table>

Table 10-3: Elemental concentrations found in Disturbed water samples from the WFS

<table>
<thead>
<tr>
<th>Element</th>
<th>Average</th>
<th>STDEV</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Co (mg/L)</td>
<td>0.3879</td>
<td>0.2413</td>
<td>0.1143</td>
<td>0.6524</td>
</tr>
<tr>
<td>Ni (mg/L)</td>
<td>2.4142</td>
<td>1.4982</td>
<td>0.6708</td>
<td>4.3860</td>
</tr>
<tr>
<td>Cu (mg/L)</td>
<td>0.0997</td>
<td>0.0832</td>
<td>0.0001</td>
<td>0.1946</td>
</tr>
<tr>
<td>Zn (mg/L)</td>
<td>4.2020</td>
<td>2.8852</td>
<td>1.4090</td>
<td>7.2950</td>
</tr>
<tr>
<td>Se (mg/L)</td>
<td>0.0012</td>
<td>0.0023</td>
<td>0.0001</td>
<td>0.0053</td>
</tr>
<tr>
<td>Cd (mg/L)</td>
<td>0.0063</td>
<td>0.0006</td>
<td>0.0055</td>
<td>0.0069</td>
</tr>
<tr>
<td>Pb (mg/L)</td>
<td>0.0269</td>
<td>0.0237</td>
<td>0.0000</td>
<td>0.0570</td>
</tr>
<tr>
<td>U (mg/L)</td>
<td>0.1537</td>
<td>0.1039</td>
<td>0.0451</td>
<td>0.2628</td>
</tr>
</tbody>
</table>
10.2 Water Graphs

Figure 10-1: Cobalt concentration in the respective water samples

Figure 10-2: Nickel concentration in the respective water samples
Figure 10-3: Copper concentration in the respective water samples

Figure 10-4: Zinc concentration in the respective water samples
Figure 10-5: Selenium concentration in the respective water samples

<table>
<thead>
<tr>
<th></th>
<th>Mooi River</th>
<th>WFS</th>
<th>Disturbed water WFS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Se</td>
<td>0.00688</td>
<td>0.06253</td>
<td>0.0012</td>
</tr>
</tbody>
</table>

Figure 10-6: Cadmium concentration in the respective water samples

<table>
<thead>
<tr>
<th></th>
<th>Mooi River</th>
<th>WFS</th>
<th>Disturbed water WFS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cd</td>
<td>0</td>
<td>0.00184</td>
<td>0.0063</td>
</tr>
</tbody>
</table>
Figure 10-7: Lead concentration in the respective water samples

Figure 10-8: Uranium concentration in the respective water samples
### 11 Appendix C - Soil

#### 11.1 Soil Data Tables

**Table 11-1: Elemental concentrations of soil samples in the respective sites**

<table>
<thead>
<tr>
<th>Element (mg/kg)</th>
<th>Soil - WFS</th>
<th></th>
<th></th>
<th>Soil - MR</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Average</td>
<td>STDEV</td>
<td>Min</td>
<td>Max</td>
<td>Average</td>
<td>STDEV</td>
</tr>
<tr>
<td>Co</td>
<td>9.70</td>
<td>1.41</td>
<td>8.00</td>
<td>11.25</td>
<td>31.40</td>
<td>18.71</td>
</tr>
<tr>
<td>Ni</td>
<td>36.50</td>
<td>7.62</td>
<td>27.50</td>
<td>45.00</td>
<td>98.00</td>
<td>48.00</td>
</tr>
<tr>
<td>Cu</td>
<td>15.30</td>
<td>4.54</td>
<td>11.50</td>
<td>20.50</td>
<td>37.65</td>
<td>21.95</td>
</tr>
<tr>
<td>Zn</td>
<td>13.00</td>
<td>0.47</td>
<td>12.50</td>
<td>13.75</td>
<td>28.00</td>
<td>1.12</td>
</tr>
<tr>
<td>Se</td>
<td>0.74</td>
<td>0.06</td>
<td>0.78</td>
<td>0.76</td>
<td>0.76</td>
<td>0.65</td>
</tr>
<tr>
<td>Cd</td>
<td>0.02</td>
<td>0.00</td>
<td>0.02</td>
<td>0.02</td>
<td>0.09</td>
<td>0.04</td>
</tr>
<tr>
<td>Pb</td>
<td>9.85</td>
<td>2.23</td>
<td>7.75</td>
<td>12.50</td>
<td>34.50</td>
<td>13.04</td>
</tr>
<tr>
<td>U</td>
<td>2.18</td>
<td>0.64</td>
<td>1.70</td>
<td>3.00</td>
<td>0.83</td>
<td>0.42</td>
</tr>
</tbody>
</table>

**Soil Data Tables continued:**

<table>
<thead>
<tr>
<th>Element (mg/kg)</th>
<th>Soil along WFS</th>
<th></th>
<th></th>
<th>Soil along MR</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Average</td>
<td>STDEV</td>
<td>Min</td>
<td>Max</td>
<td>Average</td>
<td>STDEV</td>
</tr>
<tr>
<td>Co</td>
<td>4.99</td>
<td>1.95</td>
<td>3.04</td>
<td>7.57</td>
<td>4.39</td>
<td>2.47</td>
</tr>
<tr>
<td>Ni</td>
<td>51.04</td>
<td>13.87</td>
<td>37.05</td>
<td>66.55</td>
<td>52.92</td>
<td>25.47</td>
</tr>
<tr>
<td>Cu</td>
<td>23.16</td>
<td>6.43</td>
<td>15.33</td>
<td>32.28</td>
<td>19.46</td>
<td>8.23</td>
</tr>
<tr>
<td>Zn</td>
<td>37.81</td>
<td>11.50</td>
<td>25.45</td>
<td>56.43</td>
<td>11.75</td>
<td>1.66</td>
</tr>
<tr>
<td>Se</td>
<td>1.05</td>
<td>0.15</td>
<td>0.82</td>
<td>1.25</td>
<td>0.83</td>
<td>0.16</td>
</tr>
<tr>
<td>Cd</td>
<td>0.10</td>
<td>0.06</td>
<td>0.05</td>
<td>0.18</td>
<td>0.04</td>
<td>0.02</td>
</tr>
<tr>
<td>Pb</td>
<td>19.48</td>
<td>4.95</td>
<td>11.90</td>
<td>24.53</td>
<td>14.83</td>
<td>7.34</td>
</tr>
<tr>
<td>U</td>
<td>117.02</td>
<td>87.74</td>
<td>38.70</td>
<td>227.28</td>
<td>1.60</td>
<td>0.63</td>
</tr>
</tbody>
</table>
11.2 Soil Data Graphs

Figure 11-1: Cobalt concentration in the soil samples from the respective sampling sites.

Figure 11-2: Nickel concentration in the soil samples from the respective sampling sites.
Figure 11-3: Copper concentration in the soil samples from the respective sampling sites

Figure 11-4: Zinc concentration in the soil samples from the respective sampling sites
Figure 11-5: Selenium concentration in the soil samples from the respective sampling sites

Figure 11-6: Cadmium concentration in the soil samples from the respective sampling sites
Figure 11-7: Lead concentration in the soil samples from the respective sampling sites

Figure 11-8: Uranium concentration in the soil samples from the respective sampling sites
11.3 Comparison of the Elemental Concentrations within the different particle size fractions of Soil Samples from the Respective Sites

Figure 11-9: A comparison of the elemental concentrations in the different particle size fractions (sand, silt and clay) in a soil samples from the soil along the WFS

Figure 11-10: A comparison of the elemental concentrations in the different particle size fractions (sand, silt and clay) in a soil samples from the soil along the MR
Figure 11-11: A comparison of the elemental concentrations in the different particle size fractions (sand, silt and clay) in a soil samples from the irrigated soil WFS site

Figure 11-12: A comparison of the elemental concentrations in the different particle size fractions (sand, silt and clay) in a soil samples from the irrigated soil MR group
Figure 11-13: A comparison of the elemental concentrations in the different particle size fractions (sand, silt and clay) in a soil samples from the Wetland WFS site

Figure 11-14: A comparison of the elemental concentrations in the different particle size fractions (sand, silt and clay) in a soil samples from the Control WFS site
# Appendix D - Vegetation

## 12.1 Vegetation Data Table

Table 12-1: Elemental concentrations of grass samples in the respective sites

<table>
<thead>
<tr>
<th>Elemental concentrations of grass samples in the respective sites</th>
<th>Irrigated grass - WFS</th>
<th>Irrigated grass - MR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Element</td>
<td>Average</td>
<td>STDEV</td>
</tr>
<tr>
<td>Co mg/kg</td>
<td>1.24</td>
<td>0.06</td>
</tr>
<tr>
<td>Ni mg/kg</td>
<td>15.40</td>
<td>0.68</td>
</tr>
<tr>
<td>Cu mg/kg</td>
<td>17.60</td>
<td>10.22</td>
</tr>
<tr>
<td>Zn mg/kg</td>
<td>40.50</td>
<td>6.71</td>
</tr>
<tr>
<td>Se mg/kg</td>
<td>1.69</td>
<td>0.26</td>
</tr>
<tr>
<td>Cd mg/kg</td>
<td>0.03</td>
<td>0.01</td>
</tr>
<tr>
<td>Pb mg/kg</td>
<td>4.54</td>
<td>6.69</td>
</tr>
<tr>
<td>U mg/kg</td>
<td>15.85</td>
<td>2.98</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Grass along WFS</th>
<th></th>
<th>Grass along MR</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Element</td>
<td>Average</td>
<td>STDEV</td>
<td>Min</td>
</tr>
<tr>
<td>Co mg/kg</td>
<td>7.42</td>
<td>9.69</td>
<td>0.45</td>
</tr>
<tr>
<td>Ni mg/kg</td>
<td>65.12</td>
<td>66.46</td>
<td>5.25</td>
</tr>
<tr>
<td>Cu mg/kg</td>
<td>20.42</td>
<td>7.71</td>
<td>11.00</td>
</tr>
<tr>
<td>Zn mg/kg</td>
<td>343.33</td>
<td>222.76</td>
<td>72.50</td>
</tr>
<tr>
<td>Se mg/kg</td>
<td>2.46</td>
<td>1.18</td>
<td>1.83</td>
</tr>
<tr>
<td>Cd mg/kg</td>
<td>0.15</td>
<td>0.08</td>
<td>0.05</td>
</tr>
<tr>
<td>Pb mg/kg</td>
<td>1.65</td>
<td>0.55</td>
<td>0.95</td>
</tr>
<tr>
<td>U mg/kg</td>
<td>40.10</td>
<td>87.23</td>
<td>6.50</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Grass in wetland - WFS</th>
<th>Grass in control site - WFS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Element</td>
<td>Average</td>
</tr>
<tr>
<td>Co mg/kg</td>
<td>2.07</td>
</tr>
<tr>
<td>Ni mg/kg</td>
<td>13.19</td>
</tr>
<tr>
<td>Cu mg/kg</td>
<td>7.36</td>
</tr>
<tr>
<td>Zn mg/kg</td>
<td>32.70</td>
</tr>
<tr>
<td>Se mg/kg</td>
<td>0.35</td>
</tr>
<tr>
<td>Cd mg/kg</td>
<td>0.04</td>
</tr>
<tr>
<td>Pb mg/kg</td>
<td>0.23</td>
</tr>
<tr>
<td>U mg/kg</td>
<td>13.70</td>
</tr>
</tbody>
</table>
12.2 Vegetation Data Graphs

Figure 12-1: Cobalt concentration in the grass samples from the respective sampling sites

Figure 12-2: Nickel concentration in the grass samples from the respective sampling sites
Figure 12-3: Copper concentration in the grass samples from the respective sampling sites

Figure 12-4: Zinc concentration in the grass samples from the respective sampling sites
Figure 12-5: Selenium concentration in the grass samples from the respective sampling sites

Figure 12-6: Cadmium concentration in the grass samples from the respective sampling sites
Figure 12-7: Lead concentration in the grass samples from the respective sampling site

Figure 12-8: Uranium concentration in the grass samples from the respective sampling sites
13 Appendix E - Cattle

13.1 Cattle Data Tables

Table 13-1: Elemental concentrations in the experimental group cattle tissue samples

<table>
<thead>
<tr>
<th>Experimental group - WFS</th>
<th>Liver</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th>Kidney</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Element</td>
<td>Average</td>
<td>STDEV</td>
<td>Min</td>
<td>Max</td>
<td>Average</td>
<td>STDEV</td>
<td>Min</td>
<td>Max</td>
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</tr>
<tr>
<td>Co mg/kg</td>
<td>0.30</td>
<td>0.13</td>
<td>0.09</td>
<td>0.58</td>
<td>0.27</td>
<td>0.09</td>
<td>0.17</td>
<td>0.40</td>
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</tr>
<tr>
<td>Ni mg/kg</td>
<td>0.43</td>
<td>0.16</td>
<td>0.23</td>
<td>0.69</td>
<td>0.62</td>
<td>0.22</td>
<td>0.40</td>
<td>1.08</td>
<td></td>
</tr>
<tr>
<td>Cu mg/kg</td>
<td>166.05</td>
<td>132.13</td>
<td>5.50</td>
<td>500.00</td>
<td>22.98</td>
<td>4.20</td>
<td>18.88</td>
<td>32.50</td>
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<tr>
<td>Zn mg/kg</td>
<td>304.00</td>
<td>495.80</td>
<td>107.50</td>
<td>1712.50</td>
<td>151.50</td>
<td>26.48</td>
<td>117.50</td>
<td>195.00</td>
<td></td>
</tr>
<tr>
<td>Se mg/kg</td>
<td>2.80</td>
<td>0.24</td>
<td>2.40</td>
<td>3.13</td>
<td>9.95</td>
<td>1.28</td>
<td>7.88</td>
<td>13.00</td>
<td></td>
</tr>
<tr>
<td>Cd mg/kg</td>
<td>0.12</td>
<td>0.08</td>
<td>0.01</td>
<td>0.24</td>
<td>1.33</td>
<td>0.49</td>
<td>0.71</td>
<td>2.29</td>
<td></td>
</tr>
<tr>
<td>Pb mg/kg</td>
<td>0.42</td>
<td>0.20</td>
<td>0.24</td>
<td>0.90</td>
<td>0.52</td>
<td>0.17</td>
<td>0.30</td>
<td>0.84</td>
<td></td>
</tr>
<tr>
<td>U mg/kg</td>
<td>5.07</td>
<td>9.50</td>
<td>0.56</td>
<td>31.81</td>
<td>1.74</td>
<td>1.00</td>
<td>0.75</td>
<td>4.01</td>
<td></td>
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<tr>
<td>Spleen</td>
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<td></td>
<td></td>
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<tr>
<td>Element</td>
<td>Average</td>
<td>STDEV</td>
<td>Min</td>
<td>Max</td>
<td>Average</td>
<td>STDEV</td>
<td>Min</td>
<td>Max</td>
<td></td>
</tr>
<tr>
<td>Co mg/kg</td>
<td>0.10</td>
<td>0.04</td>
<td>0.04</td>
<td>0.16</td>
<td>0.07</td>
<td>0.04</td>
<td>0.02</td>
<td>0.13</td>
<td></td>
</tr>
<tr>
<td>Ni mg/kg</td>
<td>0.50</td>
<td>0.25</td>
<td>0.24</td>
<td>0.89</td>
<td>0.56</td>
<td>0.20</td>
<td>0.31</td>
<td>1.03</td>
<td></td>
</tr>
<tr>
<td>Cu mg/kg</td>
<td>6.04</td>
<td>1.64</td>
<td>4.00</td>
<td>8.88</td>
<td>5.41</td>
<td>1.68</td>
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<td>1.58</td>
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<td>Min</td>
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<td>Average</td>
<td>STDEV</td>
<td>Min</td>
<td>Max</td>
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<td>1.41</td>
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Table 13-2: Elemental concentrations in the control group cattle tissue samples

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<th>Element</th>
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<tr>
<td>Co mg/kg</td>
<td>0.33</td>
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<td>Ni mg/kg</td>
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<table>
<thead>
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<th>Element</th>
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<td>U mg/kg</td>
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<tr>
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<td>Co mg/kg</td>
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<td>Pb mg/kg</td>
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<tr>
<td>U mg/kg</td>
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</table>
13.2 Cattle Data Graphs

Figure 13-1: Cobalt concentration in cattle tissue samples. Control group in red, experimental group in blue

Figure 13-2: Nickel concentration in cattle tissue samples. Control group in red, experimental group in blue
Figure 13-3: Copper concentration in cattle tissue samples. Control group in red, experimental group in blue

Figure 13-4: Zinc concentration in cattle tissue samples. Control group in red, experimental group in blue
Figure 13-5: Selenium concentration in cattle tissue samples. Control group in red, experimental group in blue

Figure 13-6: Cadmium concentration in cattle tissue samples. Control group in red, experimental group in blue
Figure 13-7: Lead concentration in cattle tissue samples. Control group in red, experimental group in blue

Figure 13-8: Uranium concentration in cattle tissue samples. Control group in red, experimental group in blue
Appendix F - Transfer Factors and Exposure Routes

14.1 Soil-to-plant transfer Factors

![Cobalt transfer factor](image1)

Figure 14-1: Cobalt transfer factor for the respective sampling sites

![Nickel transfer factor](image2)

Figure 14-2: Nickel transfer factor for the respective sampling sites
Figure 14-3: Copper transfer factor for the respective sampling sites

Figure 14-4: Zinc transfer factor for the respective sampling sites
Figure 14-5: Selenium transfer factor for the respective sampling sites

Figure 14-6: Cadmium transfer factor for the respective sampling sites
Figure 14-7: Lead transfer factor for the respective sampling sites

Figure 14-8: Uranium transfer factor for the respective sampling sites
14.2 Major Route of Exposure

Figure 14-9: Cobalt ingestion percentages for soil, grass and water

Figure 14-10: Nickel ingestion percentages for soil, grass and water
Figure 14-11: Copper ingestion percentages for soil, grass and water

Figure 14-12: Zinc ingestion percentages for soil, grass and water
Figure 14-13: Selenium ingestion percentages for soil, grass and water

Figure 14-14: Cadmium ingestion percentages for soil, grass and water
Figure 14-15: Lead ingestion percentages for soil, grass and water

Figure 14-16: Uranium ingestion percentages for soil, grass and water