

## ATTACHMENT "A"

To Schedule E  
(LISTING OF RIVER REACHES AND REFERENCES TO TABLES OF WATER  
QUALITY OBJECTIVES)

| <b>RIVER</b>             | <b>REACH (predetermined length)</b>                          | <b>TABLE LISTING WATER QUALITY OBJECTIVES (for River Reach)</b> |
|--------------------------|--|---|
| Beaver River             | Beaver Crossing to the Border                                | 1   |
| North Saskatchewan River | Lea Park to Lloydminster Ferry                               | 2   |
| Red Deer River A/S       | Bindloss to the Confluence with the South Saskatchewan River | 3   |
| South Saskatchewan River | Highway #41 to Confluence with Red Deer River                | 4   |
| Battle River             | Blackfoot Creek to Unwin                                     | 5   |
| Churchill River          | Islands Falls to Pukatawagan Lake                            | 6   |
| Saskatchewan River       | Outlet of Cumberland Lake to Mouth of Carrot River           | 7   |
| Carrot River             | Turnberry to Mouth of Carrot River                           | 8   |
| Red Deer River S/M       | Etomami River to Red Deer Lake                               | 9   |
| Assiniboine River        | Whitesand River to Outlet of Shellmouth Reservoir            | 10  |
| Qu'Appelle River         | Kaposvar Creek to Assiniboine River                          | 11  |
| Cold River               | Outlet of Cold Lake  | 12  |

Table 1

| WATER QUALITY OBJECTIVES – Updated 2021           |            |                            |        |
|---|------------|----------------------------|--------|
| Beaver River Reach: Beaver Crossing to the Border |            |                            |        |
| Chemical, Physical or Biological Variable         | Unit       | Acceptable Limit or Limits |        |
| <b>Nutrients</b>                                  |            | Open                       | Closed |
| Total Phosphorus                                  | mg/L       | 0.171                      | 0.127  |
| Total Dissolved Phosphorus                        | mg/L       | 0.043                      | 0.042  |
|   |            | 0.060                      | 0.060  |
| Total Nitrogen                                    | mg/L       | 1.140                      | 1.862  |
| Nitrate as N                                      | mg/L       | 3                          |        |
| Ammonia Un-ionized                                | mg/L       | 0.019 <sup>a</sup>         |        |
| <b>Major Ions</b>                                 |            |                            |        |
| Total Dissolved Solids                            | mg/L       | 500                        |        |
| Sulphate Dissolved                                | mg/L       | 250                        |        |
| Sodium Dissolved                                  | mg/L       | 200                        |        |
| Fluoride Dissolved                                | mg/L       | 0.19                       |        |
| Chloride Dissolved                                | mg/L       | 100                        |        |
| <b>Physicals and Other</b>                        |            |                            |        |
| pH Lab  | pH units   | 6.5-9.0                    |        |
| pH Field  | pH units   | 6.5-9.0                    |        |
| Oxygen Dissolved                                  |            |                            |        |
| Temperature > 5°C (Open Season)                   | mg/L       | 5                          |        |
| Temperature < 5°C (Closed Season)                 | mg/L       | No Objective               |        |
| Sodium Adsorption Ratio                           | rel units  | 3                          |        |
| Total Suspended Solids                            | mg/L       | 3.0-48.8                   |        |
| Reactive Chlorine Species                         | mg/L       | 0.0005                     |        |
| Cyanide (free)                                    | mg/L       | 0.005                      |        |
|   |            |                            |        |
| E. Coli   | No./100 mL | 200                        |        |
| Coliforms Fecal                                   | No./100 mL | 100                        |        |
| <b>Metals</b>                                     |            |                            |        |
| Arsenic Total                                     | µg/L       | 5                          |        |
| Arsenic Dissolved                                 | µg/L       | No Objective               |        |
| Barium Total                                      | µg/L       | 1000                       |        |
| Beryllium Total                                   | µg/L       | 100                        |        |
| Boron Total                                       | µg/L       | 500                        |        |
| Cadmium Total                                     | µg/L       | Calculated <sup>b</sup>    |        |
| Chromium Total                                    | µg/L       | 50                         |        |
| Cobalt Total                                      | µg/L       | 50                         |        |
| Copper Total                                      | µg/L       | Calculated <sup>b</sup>    |        |
| Iron Dissolved                                    | µg/L       | 300                        |        |
| Lead Total  | µg/L       | Calculated <sup>b</sup>    |        |
| Lithium Total                                     | µg/L       | 2500                       |        |
| Manganese Dissolved                               | µg/L       | 40.0                       | 2270.0 |
| Mercury Total                                     | µg/L       | 0.026                      |        |
| Molybdenum Total                                  | µg/L       | 10                         |        |
| Nickel Dissolved                                  | µg/L       | Calculated <sup>b</sup>    |        |
| Selenium Total                                    | µg/L       | 1                          |        |
| Silver Total                                      | µg/L       | 0.25                       |        |
| Thallium Total                                    | µg/L       | 0.8                        |        |
| Uranium Total                                     | µg/L       | 10                         |        |
| Vanadium Total                                    | µg/L       | 100                        |        |
| Zinc Dissolved                                    | µg/L       | Calculated <sup>b</sup>    |        |

| <b>Pesticides</b>                           |                           |                   |
|---|---------------------------|-------------------|
| <i>Acid Herbicides</i>                      |                           |                   |
| 2,4-D                                       | µg/L                      | 4                 |
| Bromoxynil                                  | µg/L                      | 0.33              |
| Dicamba                                     | µg/L                      | 0.006             |
| MCPA  | µg/L                      | 0.025             |
| Picloram                                    | µg/L                      | 29                |
| <i>Organochlorine Pesticides in Water</i>   |                           |                   |
| Endosulfan                                  | µg/L                      | 0.003             |
| Hexachlorocyclohexane (gamma-HCH) (Lindane) | µg/L                      | 0.01              |
| Hexachlorobenzene                           | µg/L                      | 0.52              |
| Pentachlorophenol (PCP)                     | µg/L                      | 0.5               |
| <i>Neutral Herbicides in Water</i>          |                           |                   |
| Atrazine                                    | µg/L                      | 1.8               |
| Diclofopmethyl (Hoegrass)                   | µg/L                      | 0.18              |
| Metolachlor                                 | µg/L                      | 7.8               |
| Metribuzin                                  | µg/L                      | 0.5               |
| Simazine                                    | µg/L                      | 0.5               |
| Triallate                                   | µg/L                      | 0.24              |
| Trifluralin                                 | µg/L                      | 0.2               |
| <i>Other</i>                                |                           |                   |
| Glyphosate                                  | µg/L                      | Report Detections |
| AMPA  | µg/L                      | Report Detections |
| <b>Fish Tissue</b>                          |                           |                   |
| Mercury in fish (muscle tissue)             | µg/kg                     | 200               |
| Arsenic in fish (muscle tissue)             | µg/kg                     | 3500              |
| Lead in fish (muscle tissue)                | µg/kg                     | 500               |
| DDT (total) in fish (muscle tissue)         | µg/kg                     | 5000              |
| <b>Aquatic Biota Consumption</b>            |                           |                   |
| PCB in fish (muscle tissue) mammalian       | µg TEQ/kg diet wet weight | 0.00079           |
| PCB in fish (muscle tissue) avian           | µg TEQ/kg diet wet weight | 0.0024            |
| DDT (total) in fish (muscle tissue)         | µg/kg diet wet weight     | 14                |
| Toxaphene in fish (muscle tissue)           | µg/kg diet wet weight     | 6.3               |
| <b>Radioactive</b>                          |                           |                   |
| Cesium-137                                  | Bq/L                      | 10                |
| Iodine-131                                  | Bq/L                      | 6                 |
| Lead-210                                    | Bq/L                      | 0.2               |
| Radium-226                                  | Bq/L                      | 0.5               |
| Strontium-90                                | Bq/L                      | 5                 |
| Tritium                                     | Bq/L                      | 7000              |

|                              |
|------------------------------|
| Protection of Aquatic Life   |
| Ag-Livestock                 |
| Ag-Irrigation                |
| Recreation                   |
| Treatability                 |
| Ag-Irrigation + Treatability |
| Ag- Irrigation and Livestock |
| Fish Consumption             |
| Background                   |

### Superscripts

a. Ammonia objective: Expressed as mg unionized ammonia/L. This would be equivalent to 0.0156 mg ammonia-nitrogen/L (0.019\*14.0067/17.031).

b. The objective value in µg/L is a function of total hardness (CaCO<sub>3</sub> mg/L) in the water column: Cadmium Total is calculated using Cadmium =  $10^{(0.83(\log[\text{hardness}] - 2.46))}$ . Copper Total's objective is 2 when total hardness is <82 or unknown, 4 when >180, and calculated using  $0.2 * e^{(0.8545[\ln(\text{hardness})] - 1.465)}$  when total hardness is ≥82 to ≤180. Lead Total's objective is 1 when total hardness is ≤60 or unknown, 7 when >180, and calculated using  $e^{(1.273[\ln(\text{hardness})] - 4.705)}$  when total hardness is >60 to ≤180. Nickel Dissolved is calculated using  $0.998 * e^{(0.8460[\ln(\text{hardness})] + 2.255)}$ . Zinc dissolved is calculated using  $\text{Zinc} = \exp^{(0.947[\ln(\text{hardness mg-L}^{-1})] - 0.815[\text{pH}] + 0.398[\ln(\text{DOC mg-L}^{-1})] + 4.625)}$ .

Table 2

| WATER QUALITY OBJECTIVES – Updated 2021                 |            |                            |        |
|---|------------|----------------------------|--------|
| North Sask. River Reach: Lea Park to Lloydminster Ferry |            |                            |        |
| Chemical, Physical or Biological Variable               | Unit       | Acceptable Limit or Limits |        |
| <b>Nutrients</b>  |            | Open                       | Closed |
| Total Phosphorus  | mg/L       | 0.253                      | 0.063  |
|   |            | 0.278                      | 0.115  |
| Total Dissolved Phosphorus                              | mg/L       | 0.026                      | 0.048  |
|   |            | 0.046                      | 0.101  |
| Total Nitrogen  | mg/L       | 1.169                      | 1.175  |
|   |            | 1.230                      | 1.225  |
| Nitrate as N  | mg/L       | 3                          |        |
| Ammonia Un-ionized                                      | mg/L       | 0.019 <sup>a</sup>         |        |
| <b>Major Ions</b>                                       |            |                            |        |
| Total Dissolved Solids                                  | mg/L       | 500                        |        |
| Sulphate Dissolved                                      | mg/L       | 250                        |        |
| Sodium Dissolved  | mg/L       | 200                        |        |
| Fluoride Dissolved                                      | mg/L       | 0.18                       |        |
| Chloride Dissolved                                      | mg/L       | 100                        |        |
| <b>Physicals and Other</b>                              |            |                            |        |
| pH Lab  | pH units   | 6.5-9.0                    |        |
| pH Field  | pH units   | 6.5-9.0                    |        |
| Oxygen Dissolved  |            |                            |        |
| Temperature > 5°C (Open Season)                         | mg/L       | 5                          |        |
| Temperature < 5°C (Closed Season)                       | mg/L       | 3                          |        |
| Sodium Adsorption Ratio                                 | rel units  | 3                          |        |
| Total Suspended Solids                                  | mg/L       | 5.0-295.8                  |        |
| Reactive Chlorine Species                               | mg/L       | 0.0005                     |        |
| Cyanide (free)  | mg/L       | 0.005                      |        |
|   |            |                            |        |
| E. Coli   | No./100 mL | 200                        |        |
| Coliforms Fecal   | No./100 mL | 100                        |        |
| <b>Metals</b>   |            |                            |        |
| Arsenic Total   | µg/L       | 5                          |        |
| Arsenic Dissolved                                       | µg/L       | No Objective               |        |
| Barium Total  | µg/L       | 1000                       |        |
| Beryllium Total   | µg/L       | 100                        |        |
| Boron Total   | µg/L       | 500                        |        |
| Cadmium Total   | µg/L       | Calculated <sup>b</sup>    |        |
| Chromium Total  | µg/L       | 50                         |        |
| Cobalt Total  | µg/L       | 50                         |        |
| Copper Total  | µg/L       | Calculated <sup>b</sup>    |        |
| Iron Dissolved  | µg/L       | 300                        |        |
| Lead Total  | µg/L       | Calculated <sup>b</sup>    |        |
| Lithium Total   | µg/L       | 2500                       |        |
| Manganese Dissolved                                     | µg/L       | 50                         |        |
| Mercury Total   | µg/L       | 0.026                      |        |
| Molybdenum Total  | µg/L       | 10                         |        |
| Nickel Dissolved  | µg/L       | Calculated <sup>b</sup>    |        |
| Selenium Total  | µg/L       | 1                          |        |
| Silver Total  | µg/L       | 0.25                       |        |
| Thallium Total  | µg/L       | 0.8                        |        |
| Uranium Total   | µg/L       | 10                         |        |
| Vanadium Total  | µg/L       | 100                        |        |
| Zinc Dissolved  | µg/L       | Calculated <sup>b</sup>    |        |

| <b>Pesticides</b>                           |                           |                   |
|---|---------------------------|-------------------|
| <i>Acid Herbicides</i>                      |                           |                   |
| 2,4-D                                       | µg/L                      | 4                 |
| Bromoxynil                                  | µg/L                      | 0.33              |
| Dicamba                                     | µg/L                      | 0.006             |
| MCPA  | µg/L                      | 0.025             |
| Picloram                                    | µg/L                      | 29                |
| <i>Organochlorine Pesticides in Water</i>   |                           |                   |
| Endosulfan                                  | µg/L                      | 0.003             |
| Hexachlorocyclohexane (gamma-HCH) (Lindane) | µg/L                      | 0.01              |
| Hexachlorobenzene                           | µg/L                      | 0.52              |
| Pentachlorophenol (PCP)                     | µg/L                      | 0.5               |
| <i>Neutral Herbicides in Water</i>          |                           |                   |
| Atrazine                                    | µg/L                      | 1.8               |
| Diclofopmethyl (Hoegrass)                   | µg/L                      | 0.18              |
| Metolachlor                                 | µg/L                      | 7.8               |
| Metribuzin                                  | µg/L                      | 0.5               |
| Simazine                                    | µg/L                      | 0.5               |
| Triallate                                   | µg/L                      | 0.24              |
| Trifluralin                                 | µg/L                      | 0.2               |
| <i>Other</i>                                |                           |                   |
| Glyphosate                                  | µg/L                      | Report Detections |
| AMPA  | µg/L                      | Report Detections |
| <b>Fish Tissue</b>                          |                           |                   |
| Mercury in fish (muscle tissue)             | µg/kg                     | 200               |
| Arsenic in fish (muscle tissue)             | µg/kg                     | 3500              |
| Lead in fish (muscle tissue)                | µg/kg                     | 500               |
| DDT (total) in fish (muscle tissue)         | µg/kg                     | 5000              |
| <b>Aquatic Biota Consumption</b>            |                           |                   |
| PCB in fish (muscle tissue) mammalian       | µg TEQ/kg diet wet weight | 0.00079           |
| PCB in fish (muscle tissue) avian           | µg TEQ/kg diet wet weight | 0.0024            |
| DDT (total) in fish (muscle tissue)         | µg/kg diet wet weight     | 14                |
| Toxaphene in fish (muscle tissue)           | µg/kg diet wet weight     | 6.3               |
| <b>Radioactive</b>                          |                           |                   |
| Cesium-137                                  | Bq/L                      | 10                |
| Iodine-131                                  | Bq/L                      | 6                 |
| Lead-210                                    | Bq/L                      | 0.2               |
| Radium-226                                  | Bq/L                      | 0.5               |
| Strontium-90                                | Bq/L                      | 5                 |
| Tritium                                     | Bq/L                      | 7000              |

|                              |
|------------------------------|
| Protection of Aquatic Life   |
| Ag-Livestock                 |
| Ag-Irrigation                |
| Recreation                   |
| Treatability                 |
| Ag-Irrigation + Treatability |
| Ag- Irrigation and Livestock |
| Fish Consumption             |
| Background                   |

### Superscripts

- a. Ammonia objective: Expressed as mg unionized ammonia/L. This would be equivalent to 0.0156 mg ammonia-nitrogen/L (0.019\*14.0067/17.031).
- b. The objective value in µg/L is a function of total hardness (CaCO<sub>3</sub> mg/L) in the water column: Cadmium Total is calculated using  $Cadmium = 10^{(0.83(\log[hardness]) - 2.46)}$ . Copper Total's objective is 2 when total hardness is <82 or unknown, 4 when >180, and calculated using  $0.2 * e^{(0.8545[\ln(hardness)] - 1.465)}$  when total hardness is ≥82 to ≤180. Lead Total's objective is 1 when total hardness is ≤60 or unknown, 7 when >180, and calculated using  $e^{(1.273[\ln(hardness)] - 4.705)}$  when total hardness is >60 to ≤180. Nickel Dissolved is calculated using  $0.998 * e^{(0.8460[\ln(hardness)] + 2.255)}$ . Zinc dissolved is calculated using  $Zinc = \exp^{(0.947[\ln(hardness \text{ mg-L}^{-1})] - 0.815[pH] + 0.398[\ln(DOC \text{ mg-L}^{-1})] + 4.625)}$ .

Table 3

| WATER QUALITY OBJECTIVES – Updated 2021                                  |            |                            |        |
|--|------------|----------------------------|--------|
| Red Deer River A/S Reach: Bindloss to Confluence with the S. Sask. River |            |                            |        |
| Chemical, Physical or Biological Variable                                | Unit       | Acceptable Limit or Limits |        |
| <b>Nutrients</b>   |            | Open                       | Closed |
| Total Phosphorus   | mg/L       | 0.315                      | 0.035  |
|  |            | 0.563                      | 0.069  |
| Total Dissolved Phosphorus   | mg/L       | 0.023                      | 0.008  |
|  |            | 0.035                      | 0.024  |
| Total Nitrogen   | mg/L       | 2.320                      | 0.860  |
| Nitrate as N   | mg/L       | 3                          |        |
| Ammonia Un-ionized   | mg/L       | 0.019 <sup>a</sup>         |        |
| <b>Major Ions</b>  |            |                            |        |
| Total Dissolved Solids   | mg/L       | 500                        |        |
| Sulphate Dissolved   | mg/L       | 250                        |        |
| Sodium Dissolved   | mg/L       | 200                        |        |
| Fluoride Dissolved   | mg/L       | 0.2                        |        |
| Chloride Dissolved   | mg/L       | 100                        |        |
| <b>Physicals and Other</b>   |            |                            |        |
| pH Lab   | pH units   | 6.5-9.0                    |        |
| pH Field   | pH units   | 6.5-9.0                    |        |
| Oxygen Dissolved   |            |                            |        |
| Temperature > 5°C (Open Season)  | mg/L       | 5                          |        |
| Temperature < 5°C (Closed Season)  | mg/L       | 3                          |        |
| Sodium Adsorption Ratio  | rel units  | 3                          |        |
| Total Suspended Solids   | mg/L       | 30.0-832.6                 |        |
| Reactive Chlorine Species  | mg/L       | 0.0005                     |        |
| Cyanide (free)   | mg/L       | 0.005                      |        |
|  |            |                            |        |
| E. Coli  | No./100 mL | 200                        |        |
| Coliforms Fecal  | No./100 mL | 100                        |        |
| <b>Metals</b>  |            |                            |        |
| Arsenic Total  | µg/L       | 5                          |        |
| Arsenic Dissolved  | µg/L       | No Objective               |        |
| Barium Total   | µg/L       | 1000                       |        |
| Beryllium Total  | µg/L       | 100                        |        |
| Boron Total  | µg/L       | 500                        |        |
| Cadmium Total  | µg/L       | Calculated <sup>b</sup>    |        |
| Chromium Total   | µg/L       | 50                         |        |
| Cobalt Total   | µg/L       | 50                         |        |
| Copper Total   | µg/L       | Calculated <sup>b</sup>    |        |
| Iron Dissolved   | µg/L       | 300                        |        |
| Lead Total   | µg/L       | Calculated <sup>b</sup>    |        |
| Lithium Total  | µg/L       | 2500                       |        |
| Manganese Dissolved  | µg/L       | 50                         |        |
| Mercury Total  | µg/L       | 0.026                      |        |
| Molybdenum Total   | µg/L       | 10                         |        |
| Nickel Dissolved   | µg/L       | Calculated <sup>b</sup>    |        |
| Selenium Total   | µg/L       | 1                          |        |
| Silver Total   | µg/L       | 0.25                       |        |
| Thallium Total   | µg/L       | 0.8                        |        |
| Uranium Total  | µg/L       | 10                         |        |
| Vanadium Total   | µg/L       | 100                        |        |
| Zinc Dissolved   | µg/L       | Calculated <sup>b</sup>    |        |

| <b>Pesticides</b>                           |                           |                   |
|---|---------------------------|-------------------|
| <i>Acid Herbicides</i>                      |                           |                   |
| 2,4-D                                       | µg/L                      | 4                 |
| Bromoxynil                                  | µg/L                      | 0.33              |
| Dicamba                                     | µg/L                      | 0.006             |
| MCPA  | µg/L                      | 0.025             |
| Picloram                                    | µg/L                      | 29                |
| <i>Organochlorine Pesticides in Water</i>   |                           |                   |
| Endosulfan                                  | µg/L                      | 0.003             |
| Hexachlorocyclohexane (gamma-HCH) (Lindane) | µg/L                      | 0.01              |
| Hexachlorobenzene                           | µg/L                      | 0.52              |
| Pentachlorophenol (PCP)                     | µg/L                      | 0.5               |
| <i>Neutral Herbicides in Water</i>          |                           |                   |
| Atrazine                                    | µg/L                      | 1.8               |
| Diclofopmethyl (Hoegrass)                   | µg/L                      | 0.18              |
| Metolachlor                                 | µg/L                      | 7.8               |
| Metribuzin                                  | µg/L                      | 0.5               |
| Simazine                                    | µg/L                      | 0.5               |
| Triallate                                   | µg/L                      | 0.24              |
| Trifluralin                                 | µg/L                      | 0.2               |
| <i>Other</i>                                |                           |                   |
| Glyphosate                                  | µg/L                      | Report Detections |
| AMPA  | µg/L                      | Report Detections |
| <b>Fish Tissue</b>                          |                           |                   |
| Mercury in fish (muscle tissue)             | µg/kg                     | 200               |
| Arsenic in fish (muscle tissue)             | µg/kg                     | 3500              |
| Lead in fish (muscle tissue)                | µg/kg                     | 500               |
| DDT (total) in fish (muscle tissue)         | µg/kg                     | 5000              |
| <b>Aquatic Biota Consumption</b>            |                           |                   |
| PCB in fish (muscle tissue) mammalian       | µg TEQ/kg diet wet weight | 0.00079           |
| PCB in fish (muscle tissue) avian           | µg TEQ/kg diet wet weight | 0.0024            |
| DDT (total) in fish (muscle tissue)         | µg/kg diet wet weight     | 14                |
| Toxaphene in fish (muscle tissue)           | µg/kg diet wet weight     | 6.3               |
| <b>Radioactive</b>                          |                           |                   |
| Cesium-137                                  | Bq/L                      | 10                |
| Iodine-131                                  | Bq/L                      | 6                 |
| Lead-210                                    | Bq/L                      | 0.2               |
| Radium-226                                  | Bq/L                      | 0.5               |
| Strontium-90                                | Bq/L                      | 5                 |
| Tritium                                     | Bq/L                      | 7000              |

|                              |
|------------------------------|
| Protection of Aquatic Life   |
| Ag-Livestock                 |
| Ag-Irrigation                |
| Recreation                   |
| Treatability                 |
| Ag-Irrigation + Treatability |
| Ag- Irrigation and Livestock |
| Fish Consumption             |
| Background                   |

### Superscripts

a. Ammonia objective: Expressed as mg unionized ammonia/L. This would be equivalent to 0.0156 mg ammonia-nitrogen/L (0.019\*14.0067/17.031).

b. The objective value in µg/L is a function of total hardness (CaCO<sub>3</sub> mg/L) in the water column: Cadmium Total is calculated using Cadmium =  $10^{(0.83(\log[\text{hardness}]) - 2.46)}$ . Copper Total's objective is 2 when total hardness is <82 or unknown, 4 when >180, and calculated using  $0.2 * e^{(0.8545[\ln(\text{hardness})] - 1.465)}$  when total hardness is ≥82 to ≤180. Lead Total's objective is 1 when total hardness is ≤60 or unknown, 7 when >180, and calculated using  $e^{(1.273[\ln(\text{hardness})] - 4.705)}$  when total hardness is >60 to ≤180. Nickel Dissolved is calculated using  $0.998 * e^{(0.8460[\ln(\text{hardness})] + 2.255)}$ . Zinc dissolved is calculated using  $\text{Zinc} = \exp^{(0.947[\ln(\text{hardness mg-L}^{-1})] - 0.815[\text{pH}] + 0.398[\ln(\text{DOC mg-L}^{-1})] + 4.625)}$ .

Table 4

| WATER QUALITY OBJECTIVES – Updated 2021                                |            |                            |        |
|--|------------|----------------------------|--------|
| South Sask. River Reach: Highway #41 to Confluence with Red Deer River |            |                            |        |
| Chemical, Physical or Biological Variable                              | Unit       | Acceptable Limit or Limits |        |
| <b>Nutrients</b>   |            | Open                       | Closed |
| Total Phosphorus   | mg/L       | 0.159                      | 0.054  |
|  |            | 0.246                      | 0.110  |
| Total Dissolved Phosphorus   | mg/L       | 0.014                      | 0.010  |
|  |            | 0.018                      | 0.067  |
| Total Nitrogen   | mg/L       | 1.073                      | 1.638  |
|  |            | 1.114                      | 1.771  |
| Nitrate as N   | mg/L       | 3                          |        |
| Ammonia Un-ionized   | mg/L       | 0.019 <sup>a</sup>         |        |
| <b>Major Ions</b>  |            |                            |        |
| Total Dissolved Solids   | mg/L       | 500                        |        |
| Sulphate Dissolved   | mg/L       | 250                        |        |
| Sodium Dissolved   | mg/L       | 200                        |        |
| Fluoride Dissolved   | mg/L       | 0.19                       |        |
| Chloride Dissolved   | mg/L       | 100                        |        |
| <b>Physicals and Other</b>   |            |                            |        |
| pH Lab   | pH units   | 6.5-9.0                    |        |
| pH Field   | pH units   | 6.5-9.0                    |        |
| Oxygen Dissolved   |            |                            |        |
| Temperature > 5°C (Open Season)  | mg/L       | 5                          |        |
| Temperature < 5°C (Closed Season)                                      | mg/L       | 3                          |        |
| Sodium Adsorption Ratio  | rel units  | 3                          |        |
| Total Suspended Solids   | mg/L       | 5.6-339.8                  |        |
| Reactive Chlorine Species  | mg/L       | 0.0005                     |        |
| Cyanide (free)   | mg/L       | 0.005                      |        |
|  |            |                            |        |
| E. Coli  | No./100 mL | 200                        |        |
| Coliforms Fecal  | No./100 mL | 100                        |        |
| <b>Metals</b>  |            |                            |        |
| Arsenic Total  | µg/L       | 5                          |        |
| Arsenic Dissolved  | µg/L       | No Objective               |        |
| Barium Total   | µg/L       | 1000                       |        |
| Beryllium Total  | µg/L       | 100                        |        |
| Boron Total  | µg/L       | 500                        |        |
| Cadmium Total  | µg/L       | Calculated <sup>b</sup>    |        |
| Chromium Total   | µg/L       | 50                         |        |
| Cobalt Total   | µg/L       | 50                         |        |
| Copper Total   | µg/L       | Calculated <sup>b</sup>    |        |
| Iron Dissolved   | µg/L       | 300                        |        |
| Lead Total   | µg/L       | Calculated <sup>b</sup>    |        |
| Lithium Total  | µg/L       | 2500                       |        |
| Manganese Dissolved  | µg/L       | 50                         |        |
| Mercury Total  | µg/L       | 0.026                      |        |
| Molybdenum Total   | µg/L       | 10                         |        |
| Nickel Dissolved   | µg/L       | Calculated <sup>b</sup>    |        |
| Selenium Total   | µg/L       | 1                          |        |
| Silver Total   | µg/L       | 0.25                       |        |
| Thallium Total   | µg/L       | 0.8                        |        |
| Uranium Total  | µg/L       | 10                         |        |
| Vanadium Total   | µg/L       | 100                        |        |
| Zinc dissolved   | µg/L       | Calculated <sup>b</sup>    |        |



| <b>Pesticides</b>                           |                           |                   |
|---|---------------------------|-------------------|
| <i>Acid Herbicides</i>                      |                           |                   |
| 2,4-D                                       | µg/L                      | 4                 |
| Bromoxynil                                  | µg/L                      | 0.33              |
| Dicamba                                     | µg/L                      | 0.006             |
| MCPA  | µg/L                      | 0.025             |
| Picloram                                    | µg/L                      | 29                |
| <i>Organochlorine Pesticides in Water</i>   |                           |                   |
| Endosulfan                                  | µg/L                      | 0.003             |
| Hexachlorocyclohexane (gamma-HCH) (Lindane) | µg/L                      | 0.01              |
| Hexachlorobenzene                           | µg/L                      | 0.52              |
| Pentachlorophenol (PCP)                     | µg/L                      | 0.5               |
| <i>Neutral Herbicides in Water</i>          |                           |                   |
| Atrazine                                    | µg/L                      | 1.8               |
| Diclofopmethyl (Hoegrass)                   | µg/L                      | 0.18              |
| Metolachlor                                 | µg/L                      | 7.8               |
| Metribuzin                                  | µg/L                      | 0.5               |
| Simazine                                    | µg/L                      | 0.5               |
| Triallate                                   | µg/L                      | 0.24              |
| Trifluralin                                 | µg/L                      | 0.2               |
| <i>Other</i>                                |                           |                   |
| Glyphosate                                  | µg/L                      | Report Detections |
| AMPA  | µg/L                      | Report Detections |
| <b>Fish Tissue</b>                          |                           |                   |
| Mercury in fish (muscle tissue)             | µg/kg                     | 200               |
| Arsenic in fish (muscle tissue)             | µg/kg                     | 3500              |
| Lead in fish (muscle tissue)                | µg/kg                     | 500               |
| DDT (total) in fish (muscle tissue)         | µg/kg                     | 5000              |
| <b>Aquatic Biota Consumption</b>            |                           |                   |
| PCB in fish (muscle tissue) mammalian       | µg TEQ/kg diet wet weight | 0.00079           |
| PCB in fish (muscle tissue) avian           | µg TEQ/kg diet wet weight | 0.0024            |
| DDT (total) in fish (muscle tissue)         | µg/kg diet wet weight     | 14                |
| Toxaphene in fish (muscle tissue)           | µg/kg diet wet weight     | 6.3               |
| <b>Radioactive</b>                          |                           |                   |
| Cesium-137                                  | Bq/L                      | 10                |
| Iodine-131                                  | Bq/L                      | 6                 |
| Lead-210                                    | Bq/L                      | 0.2               |
| Radium-226                                  | Bq/L                      | 0.5               |
| Strontium-90                                | Bq/L                      | 5                 |
| Tritium                                     | Bq/L                      | 7000              |

|                              |
|------------------------------|
| Protection of Aquatic Life   |
| Ag-Livestock                 |
| Ag-Irrigation                |
| Recreation                   |
| Treatability                 |
| Ag-Irrigation + Treatability |
| Ag- Irrigation and Livestock |
| Fish Consumption             |
| Background                   |

### Superscripts

a. Ammonia objective: Expressed as mg unionized ammonia/L. This would be equivalent to 0.0156 mg ammonia-nitrogen/L (0.019\*14.0067/17.031).

b. The objective value in µg/L is a function of total hardness (CaCO<sub>3</sub> mg/L) in the water column: Cadmium Total is calculated using Cadmium =  $10^{(0.83(\log[\text{hardness}]) - 2.46)}$ . Copper Total's objective is 2 when total hardness is <82 or unknown, 4 when >180, and calculated using  $0.2 * e^{(0.8545[\ln(\text{hardness})] - 1.465)}$  when total hardness is ≥82 to ≤180. Lead Total's objective is 1 when total hardness is ≤60 or unknown, 7 when >180, and calculated using  $e^{(1.273[\ln(\text{hardness})] - 4.705)}$  when total hardness is >60 to ≤180. Nickel Dissolved is calculated using  $0.998 * e^{(0.8460[\ln(\text{hardness})] + 2.255)}$ . Zinc dissolved is calculated using  $\text{Zinc} = \exp(0.947[\ln(\text{hardness mg-L}^{-1})] - 0.815[\text{pH}] + 0.398[\ln(\text{DOC mg-L}^{-1})] + 4.625)$ .

Table 5

| WATER QUALITY OBJECTIVES – Updated 2021      |            |                            |        |
|--|------------|----------------------------|--------|
| Battle River Reach: Blackfoot Creek to Unwin |            |                            |        |
| Chemical, Physical or Biological Variable    | Unit       | Acceptable Limit or Limits |        |
| <b>Nutrients</b>                             |            | Open                       | Closed |
| Total Phosphorus                             | mg/L       | 0.267                      | 0.075  |
|  |            | 0.335                      | 0.100  |
| Total Dissolved Phosphorus                   | mg/L       | 0.051                      | 0.045  |
| Total Nitrogen                               | mg/L       | 2.260                      | 1.550  |
| Nitrate as N                                 | mg/L       | 3                          |        |
| Ammonia Un-ionized                           | mg/L       | 0.019 <sup>a</sup>         |        |
| <b>Major Ions</b>                            |            |                            |        |
| Total Dissolved Solids                       | mg/L       | 872                        |        |
| Sulphate Dissolved                           | mg/L       | 250                        |        |
| Sodium Dissolved                             | mg/L       | 200                        |        |
| Fluoride Dissolved                           | mg/L       | 0.31                       |        |
| Chloride Dissolved                           | mg/L       | 100                        |        |
| <b>Physicals and Other</b>                   |            |                            |        |
| pH Lab                                       | pH units   | 6.5-9.0                    |        |
| pH Field                                     | pH units   | 6.5-9.0                    |        |
| Oxygen Dissolved                             |            |                            |        |
| Temperature > 5°C (Open Season)              | mg/L       | 5                          |        |
| Temperature < 5°C (Closed Season)            | mg/L       | No Objective               |        |
| Sodium Adsorption Ratio                      | rel units  | No Objective               |        |
| Total Suspended Solids                       | mg/L       | 5.0 - 320.0                |        |
| Reactive Chlorine Species                    | mg/L       | 0.0005                     |        |
| Cyanide (free)                               | mg/L       | 0.005                      |        |
| <b>Biota</b>                                 |            |                            |        |
| E. Coli                                      | No./100 mL | 200                        |        |
| Coliforms Fecal                              | No./100 mL | 100                        |        |
| <b>Metals</b>                                |            |                            |        |
| Arsenic Total                                | µg/L       | 5                          |        |
| Arsenic Dissolved                            | µg/L       | No Objective               |        |
| Barium Total                                 | µg/L       | 1000                       |        |
| Beryllium Total                              | µg/L       | 100                        |        |
| Boron Total                                  | µg/L       | 500                        |        |
| Cadmium Total                                | µg/L       | Calculated <sup>b</sup>    |        |
| Chromium Total                               | µg/L       | 50                         |        |
| Cobalt Total                                 | µg/L       | 50                         |        |
| Copper Total                                 | µg/L       | Calculated <sup>b</sup>    |        |
| Iron Dissolved                               | µg/L       | 300                        |        |
| Lead Total                                   | µg/L       | Calculated <sup>b</sup>    |        |
| Lithium Total                                | µg/L       | 2500                       |        |
| Manganese Dissolved                          | µg/L       | 27.0                       | 1257.0 |
| Mercury Total                                | µg/L       | 0.026                      |        |
| Molybdenum Total                             | µg/L       | 10                         |        |
| Nickel Dissolved                             | µg/L       | Calculated <sup>b</sup>    |        |
| Selenium Total                               | µg/L       | 1                          |        |
| Silver Total                                 | µg/L       | 0.25                       |        |
| Thallium Total                               | µg/L       | 0.8                        |        |
| Uranium Total                                | µg/L       | 10                         |        |
| Vanadium Total                               | µg/L       | 100                        |        |
| Zinc Dissolved                               | µg/L       | Calculated <sup>b</sup>    |        |

| <b>Pesticides</b>                           |                           |                   |
|---|---------------------------|-------------------|
| <i>Acid Herbicides</i>                      |                           |                   |
| 2,4-D                                       | µg/L                      | 4                 |
| Bromoxynil                                  | µg/L                      | 0.33              |
| Dicamba                                     | µg/L                      | 0.006             |
| MCPA  | µg/L                      | 0.025             |
| Picloram                                    | µg/L                      | 29                |
| <i>Organochlorine Pesticides in Water</i>   |                           |                   |
| Endosulfan                                  | µg/L                      | 0.003             |
| Hexachlorocyclohexane (gamma-HCH) (Lindane) | µg/L                      | 0.01              |
| Hexachlorobenzene                           | µg/L                      | 0.52              |
| Pentachlorophenol (PCP)                     | µg/L                      | 0.5               |
| <i>Neutral Herbicides in Water</i>          |                           |                   |
| Atrazine                                    | µg/L                      | 1.8               |
| Diclofopmethyl (Hoegrass)                   | µg/L                      | 0.18              |
| Metolachlor                                 | µg/L                      | 7.8               |
| Metribuzin                                  | µg/L                      | 0.5               |
| Simazine                                    | µg/L                      | 0.5               |
| Triallate                                   | µg/L                      | 0.24              |
| Trifluralin                                 | µg/L                      | 0.2               |
| <i>Other</i>                                |                           |                   |
| Glyphosate                                  | µg/L                      | Report Detections |
| AMPA  | µg/L                      | Report Detections |
| <b>Fish Tissue</b>                          |                           |                   |
| Mercury in fish (muscle tissue)             | µg/kg                     | 200               |
| Arsenic in fish (muscle tissue)             | µg/kg                     | 3500              |
| Lead in fish (muscle tissue)                | µg/kg                     | 500               |
| DDT (total) in fish (muscle tissue)         | µg/kg                     | 5000              |
| <b>Aquatic Biota Consumption</b>            |                           |                   |
| PCB in fish (muscle tissue) mammalian       | µg TEQ/kg diet wet weight | 0.00079           |
| PCB in fish (muscle tissue) avian           | µg TEQ/kg diet wet weight | 0.0024            |
| DDT (total) in fish (muscle tissue)         | µg/kg diet wet weight     | 14                |
| Toxaphene in fish (muscle tissue)           | µg/kg diet wet weight     | 6.3               |
| <b>Radioactive</b>                          |                           |                   |
| Cesium-137                                  | Bq/L                      | 10                |
| Iodine-131                                  | Bq/L                      | 6                 |
| Lead-210                                    | Bq/L                      | 0.2               |
| Radium-226                                  | Bq/L                      | 0.5               |
| Strontium-90                                | Bq/L                      | 5                 |
| Tritium                                     | Bq/L                      | 7000              |

|                              |
|------------------------------|
| Protection of Aquatic Life   |
| Ag-Livestock                 |
| Ag-Irrigation                |
| Recreation                   |
| Treatability                 |
| Ag-Irrigation + Treatability |
| Ag- Irrigation and Livestock |
| Fish Consumption             |
| Background                   |

### Superscripts

a. Ammonia objective: Expressed as mg unionized ammonia/L. This would be equivalent to 0.0156 mg ammonia-nitrogen/L (0.019\*14.0067/17.031).

b. The objective value in µg/L is a function of total hardness (CaCO<sub>3</sub> mg/L) in the water column: Cadmium Total is calculated using Cadmium =  $10^{(0.83(\log[\text{hardness}]) - 2.46)}$ . Copper Total's objective is 2 when total hardness is <82 or unknown, 4 when >180, and calculated using  $0.2 * e^{(0.8545[\ln(\text{hardness})] - 1.465)}$  when total hardness is ≥82 to ≤180. Lead Total's objective is 1 when total hardness is ≤60 or unknown, 7 when >180, and calculated using  $e^{(1.273[\ln(\text{hardness})] - 4.705)}$  when total hardness is >60 to ≤180. Nickel Dissolved is calculated using  $0.998 * e^{(0.8460[\ln(\text{hardness})] + 2.255)}$ . Zinc dissolved is calculated using  $\text{Zinc} = \exp^{(0.947[\ln(\text{hardness mg-L}^{-1})] - 0.815[\text{pH}] + 0.398[\ln(\text{DOC mg-L}^{-1})] + 4.625)}$ .

Table 6

| WATER QUALITY OBJECTIVES – Updated 2021                 |            |                            |        |
|---|------------|----------------------------|--------|
| Churchill River Reach: Island Falls to Pukatawagan Lake |            |                            |        |
| Chemical, Physical or Biological Variable               | Unit       | Acceptable Limit or Limits |        |
|   |            | Open                       | Closed |
| <b>Nutrients</b>  |            |                            |        |
| Total Phosphorus  | mg/L       | 0.025                      | 0.021  |
| Total Dissolved Phosphorus                              | mg/L       | 0.010                      | 0.010  |
| Total Nitrogen  | mg/L       | 0.484                      | 0.411  |
| Nitrate as N  | mg/L       | 3                          |        |
| Ammonia Un-ionized                                      | mg/L       | 0.019 <sup>a</sup>         |        |
| <b>Major Ions</b>                                       |            |                            |        |
| Total Dissolved Solids                                  | mg/L       | 500                        |        |
| Sulphate Dissolved                                      | mg/L       | 250                        |        |
| Sodium Dissolved  | mg/L       | 200                        |        |
| Fluoride Dissolved                                      | mg/L       | 0.12                       |        |
| Chloride Dissolved                                      | mg/L       | 100                        |        |
| <b>Physicals and Other</b>                              |            |                            |        |
| pH Lab  | pH units   | 6.5-9.0                    |        |
| pH Field  | pH units   | 6.5-9.0                    |        |
| Oxygen Dissolved  |            |                            |        |
| Temperature > 5°C (Open Season)                         | mg/L       | 5                          |        |
| Temperature < 5°C (Closed Season)                       | mg/L       | 3                          |        |
| Sodium Adsorption Ratio                                 | rel units  | 3                          |        |
| Total Suspended Solids                                  | mg/L       | 2.2-6.2                    |        |
| Reactive Chlorine Species                               | mg/L       | 0.0005                     |        |
| Cyanide (free)  | mg/L       | 0.005                      |        |
| <b>Biota</b>  |            |                            |        |
| E. Coli   | No./100 mL | 200                        |        |
| Coliforms Fecal   | No./100 mL | 100                        |        |
| <b>Metals</b>   |            |                            |        |
| Arsenic Total   | µg/L       | 5                          |        |
| Arsenic Dissolved                                       | µg/L       | No Objective               |        |
| Barium Total  | µg/L       | 1000                       |        |
| Beryllium Total   | µg/L       | 100                        |        |
| Boron Total   | µg/L       | 500                        |        |
| Cadmium Total   | µg/L       | Calculated <sup>b</sup>    |        |
| Chromium Total  | µg/L       | 50                         |        |
| Cobalt Total  | µg/L       | 50                         |        |
| Copper Total  | µg/L       | Calculated <sup>b</sup>    |        |
| Iron Dissolved  | µg/L       | 300                        |        |
| Lead Total  | µg/L       | Calculated <sup>b</sup>    |        |
| Lithium Total   | µg/L       | 2500                       |        |
| Manganese Dissolved                                     | µg/L       | 50                         |        |
| Mercury Total   | µg/L       | 0.026                      |        |
| Molybdenum Total  | µg/L       | 10                         |        |
| Nickel Dissolved  | µg/L       | Calculated <sup>b</sup>    |        |
| Selenium Total  | µg/L       | 1                          |        |
| Silver Total  | µg/L       | 0.25                       |        |
| Thallium Total  | µg/L       | 0.8                        |        |
| Uranium Total   | µg/L       | 10                         |        |
| Vanadium Total  | µg/L       | 100                        |        |
| Zinc Dissolved  | µg/L       | Calculated <sup>b</sup>    |        |

| <b>Pesticides</b>                           |                           |                    |
|---|---------------------------|--------------------|
| <i>Acid Herbicides</i>                      |                           |                    |
| 2,4-D                                       | µg/L                      | 4                  |
| Bromoxynil                                  | µg/L                      | 0.33               |
| Dicamba                                     | µg/L                      | 0.006              |
| MCPA  | µg/L                      | 0.025              |
| Picloram                                    | µg/L                      | 29                 |
| <i>Organochlorine Pesticides in Water</i>   |                           |                    |
| Endosulfan                                  | µg/L                      | 0.003              |
| Hexachlorocyclohexane (gamma-HCH) (Lindane) | µg/L                      | 0.01               |
| Hexachlorobenzene                           | µg/L                      | 0.52               |
| Pentachlorophenol (PCP)                     | µg/L                      | 0.5                |
| <i>Neutral Herbicides in Water</i>          |                           |                    |
| Atrazine                                    | µg/L                      | 1.8                |
| Diclofopmethyl (Hoegrass)                   | µg/L                      | 0.18               |
| Metolachlor                                 | µg/L                      | 7.8                |
| Metribuzin                                  | µg/L                      | 0.5                |
| Simazine                                    | µg/L                      | 0.5                |
| Triallate                                   | µg/L                      | 0.24               |
| Trifluralin                                 | µg/L                      | 0.2                |
| <i>Other</i>                                |                           |                    |
| Glyphosate                                  | µg/L                      | Report Detections  |
| AMPA  | µg/L                      | Report Detecetions |
| <b>Fish Tissue</b>                          |                           |                    |
| Mercury in fish (muscle tissue)             | µg/kg                     | 200                |
| Arsenic in fish (muscle tissue)             | µg/kg                     | 3500               |
| Lead in fish (muscle tissue)                | µg/kg                     | 500                |
| DDT (total) in fish (muscle tissue)         | µg/kg                     | 5000               |
| <b>Aquatic Biota Consumption</b>            |                           |                    |
| PCB in fish (muscle tissue) mammalian       | µg TEQ/kg diet wet weight | 0.00079            |
| PCB in fish (muscle tissue) avian           | µg TEQ/kg diet wet weight | 0.0024             |
| DDT (total) in fish (muscle tissue)         | µg/kg diet wet weight     | 14                 |
| Toxaphene in fish (muscle tissue)           | µg/kg diet wet weight     | 6.3                |
| <b>Radioactive</b>                          |                           |                    |
| Cesium-137                                  | Bq/L                      | 10                 |
| Iodine-131                                  | Bq/L                      | 6                  |
| Lead-210                                    | Bq/L                      | 0.2                |
| Radium-226                                  | Bq/L                      | 0.5                |
| Strontium-90                                | Bq/L                      | 5                  |
| Tritium                                     | Bq/L                      | 7000               |

|                              |
|------------------------------|
| Protection of Aquatic Life   |
| Ag-Livestock                 |
| Ag-Irrigation                |
| Recreation                   |
| Treatability                 |
| Ag-Irrigation + Treatability |
| Ag- Irrigation and Livestock |
| Fish Consumption             |
| Background                   |

### Superscripts

a. Ammonia objective: Expressed as mg unionized ammonia/L. This would be equivalent to 0.0156 mg ammonia-nitrogen/L (0.019\*14.0067/17.031).

b. The objective value in µg/L is a function of total hardness (CaCO<sub>3</sub> mg/L) in the water column: Cadmium Total is calculated using Cadmium =  $10^{(0.83(\log[\text{hardness}]) - 2.46)}$ , Copper Total's objective is 2 when total hardness is <82 or unknown, 4 when >180, and calculated using  $0.2 * e^{(0.8545[\ln(\text{hardness})] - 1.465)}$  when total hardness is ≥82 to ≤180. Lead Total's objective is 1 when total hardness is ≤60 or unknown, 7 when >180, and calculated using  $e^{(1.273[\ln(\text{hardness})] - 4.705)}$  when total hardness is >60 to ≤180. Nickel Dissolved is calculated using  $0.998 * e^{(0.8460[\ln(\text{hardness})] + 2.255)}$ . Zinc dissolved is calculated using  $\text{Zinc} = \exp^{(0.947[\ln(\text{hardness mg-L}^{-1})] - 0.815[\text{pH}] + 0.398[\ln(\text{DOC mg-L}^{-1})] + 4.625)}$ .

Table 7

| WATER QUALITY OBJECTIVES – Updated 2021                                      |            |                            |        |
|--|------------|----------------------------|--------|
| Saskatchewan River Reach: Outlet of Cumberland Lake to Mouth of Carrot River |            |                            |        |
| Chemical, Physical or Biological Variable                                    | Unit       | Acceptable Limit or Limits |        |
| <b>Nutrients</b>   |            | Open                       | Closed |
| Total Phosphorus   | mg/L       | 0.088                      | 0.028  |
|  |            | 0.124                      | 0.034  |
| Total Dissolved Phosphorus   | mg/L       | 0.014                      | 0.011  |
|  |            | 0.018                      | 0.017  |
| Total Nitrogen   | mg/L       | 0.838                      | 0.761  |
| Nitrate as N   | mg/L       | 3                          |        |
| Ammonia Un-ionized   | mg/L       | 0.019 <sup>a</sup>         |        |
| <b>Major Ions</b>  |            |                            |        |
| Total Dissolved Solids   | mg/L       | 500                        |        |
| Sulphate Dissolved   | mg/L       | 250                        |        |
| Sodium Dissolved   | mg/L       | 200                        |        |
| Fluoride Dissolved   | mg/L       | 0.18                       |        |
| Chloride Dissolved   | mg/L       | 100                        |        |
| <b>Physicals and Other</b>   |            |                            |        |
| pH Lab   | pH units   | 6.5-9.0                    |        |
| pH Field   | pH units   | 6.5-9.0                    |        |
| Oxygen Dissolved   |            |                            |        |
| Temperature > 5°C (Open Season)  | mg/L       | 5                          |        |
| Temperature < 5°C (Closed Season)  | mg/L       | 3                          |        |
| Sodium Adsorption Ratio  | rel units  | 3                          |        |
| Total Suspended Solids   | mg/L       | 27.0 - 125.0               |        |
| Reactive Chlorine Species  | mg/L       | 0.0005                     |        |
| Cyanide (free)   | mg/L       | 0.005                      |        |
|  |            |                            |        |
| E. Coli  | No./100 mL | 200                        |        |
| Coliforms Fecal  | No./100 mL | 100                        |        |
| <b>Metals</b>  |            |                            |        |
| Arsenic Total  | µg/L       | 5                          |        |
| Arsenic Dissolved  | µg/L       | No Objective               |        |
| Barium Total   | µg/L       | 1000                       |        |
| Beryllium Total  | µg/L       | 100                        |        |
| Boron Total  | µg/L       | 500                        |        |
| Cadmium Total  | µg/L       | Calculated <sup>b</sup>    |        |
| Chromium Total   | µg/L       | 50                         |        |
| Cobalt Total   | µg/L       | 50                         |        |
| Copper Total   | µg/L       | Calculated <sup>b</sup>    |        |
| Iron Dissolved   | µg/L       | 300                        |        |
| Lead Total   | µg/L       | Calculated <sup>b</sup>    |        |
| Lithium Total  | µg/L       | 2500                       |        |
| Manganese Dissolved  | µg/L       | 50                         |        |
| Mercury Total  | µg/L       | 0.026                      |        |
| Molybdenum Total   | µg/L       | 10                         |        |
| Nickel Dissolved   | µg/L       | Calculated <sup>b</sup>    |        |
| Selenium Total   | µg/L       | 1                          |        |
| Silver Total   | µg/L       | 0.25                       |        |
| Thallium Total   | µg/L       | 0.8                        |        |
| Uranium Total  | µg/L       | 10                         |        |
| Vanadium Total   | µg/L       | 100                        |        |
| Zinc Dissolved   | µg/L       | Calculated <sup>b</sup>    |        |

| <b>Pesticides</b>                           |                           |                   |
|---|---------------------------|-------------------|
| <i>Acid Herbicides</i>                      |                           |                   |
| 2,4-D                                       | µg/L                      | 4                 |
| Bromoxynil                                  | µg/L                      | 0.33              |
| Dicamba                                     | µg/L                      | 0.006             |
| MCPA  | µg/L                      | 0.025             |
| Picloram                                    | µg/L                      | 29                |
| <i>Organochlorine Pesticides in Water</i>   |                           |                   |
| Endosulfan                                  | µg/L                      | 0.003             |
| Hexachlorocyclohexane (gamma-HCH) (Lindane) | µg/L                      | 0.01              |
| Hexachlorobenzene                           | µg/L                      | 0.52              |
| Pentachlorophenol (PCP)                     | µg/L                      | 0.5               |
| <i>Neutral Herbicides in Water</i>          |                           |                   |
| Atrazine                                    | µg/L                      | 1.8               |
| Diclofopmethyl (Hoegrass)                   | µg/L                      | 0.18              |
| Metolachlor                                 | µg/L                      | 7.8               |
| Metribuzin                                  | µg/L                      | 0.5               |
| Simazine                                    | µg/L                      | 0.5               |
| Triallate                                   | µg/L                      | 0.24              |
| Trifluralin                                 | µg/L                      | 0.2               |
| <i>Other</i>                                |                           |                   |
| Glyphosate                                  | µg/L                      | Report Detections |
| AMPA  | µg/L                      | Report Detections |
| <b>Fish Tissue</b>                          |                           |                   |
| Mercury in fish (muscle tissue)             | µg/kg                     | 200               |
| Arsenic in fish (muscle tissue)             | µg/kg                     | 3500              |
| Lead in fish (muscle tissue)                | µg/kg                     | 500               |
| DDT (total) in fish (muscle tissue)         | µg/kg                     | 5000              |
| <b>Aquatic Biota Consumption</b>            |                           |                   |
| PCB in fish (muscle tissue) mammalian       | µg TEQ/kg diet wet weight | 0.00079           |
| PCB in fish (muscle tissue) avian           | µg TEQ/kg diet wet weight | 0.0024            |
| DDT (total) in fish (muscle tissue)         | µg/kg diet wet weight     | 14                |
| Toxaphene in fish (muscle tissue)           | µg/kg diet wet weight     | 6.3               |
| <b>Radioactive</b>                          |                           |                   |
| Cesium-137                                  | Bq/L                      | 10                |
| Iodine-131                                  | Bq/L                      | 6                 |
| Lead-210                                    | Bq/L                      | 0.2               |
| Radium-226                                  | Bq/L                      | 0.5               |
| Strontium-90                                | Bq/L                      | 5                 |
| Tritium                                     | Bq/L                      | 7000              |

|                              |
|------------------------------|
| Protection of Aquatic Life   |
| Ag-Livestock                 |
| Ag-Irrigation                |
| Recreation                   |
| Treatability                 |
| Ag-Irrigation + Treatability |
| Ag- Irrigation and Livestock |
| Fish Consumption             |
| Background                   |

### Superscripts

a. Ammonia objective: Expressed as mg unionized ammonia/L. This would be equivalent to 0.0156 mg ammonia-nitrogen/L (0.019\*14.0067/17.031).

b. The objective value in µg/L is a function of total hardness (CaCO<sub>3</sub> mg/L) in the water column: Cadmium Total is calculated using  $Cadmium = 10^{(0.83(\log[hardness]) - 2.46)}$ , Copper Total's objective is 2 when total hardness is <82 or unknown, 4 when >180, and calculated using  $0.2 * e^{(0.8545[\ln(hardness)] - 1.465)}$  when total hardness is ≥82 to ≤180. Lead Total's objective is 1 when total hardness is ≤60 or unknown, 7 when >180, and calculated using  $e^{(1.273[\ln(hardness)] - 4.705)}$  when total hardness is >60 to ≤180. Nickel Dissolved is calculated using  $0.998 * e^{(0.8460[\ln(hardness)] + 2.255)}$ . Zinc dissolved is calculated using  $Zinc = \exp^{(0.947[\ln(hardness \text{ mg-L}^{-1})] - 0.815[pH] + 0.398[\ln(DOC \text{ mg-L}^{-1})] + 4.625)}$ .

Table 8

| WATER QUALITY OBJECTIVES – Updated 2021                |            |                            |        |
|--|------------|----------------------------|--------|
| Carrot River Reach: Turnberry to Mouth of Carrot River |            |                            |        |
| Chemical, Physical or Biological Variable              | Unit       | Acceptable Limit or Limits |        |
| <b>Nutrients</b>                                       |            | Open                       | Closed |
| Total Phosphorus                                       | mg/L       | 0.099                      | 0.170  |
|  |            | 0.140                      | 0.266  |
| Total Dissolved Phosphorus                             | mg/L       | 0.027                      | 0.031  |
|  |            | 0.057                      | 0.059  |
| Total Nitrogen   | mg/L       | 1.087                      | 1.814  |
|  |            | 1.417                      | 2.052  |
| Nitrate as N   | mg/L       | 3                          |        |
| Ammonia Un-ionized                                     | mg/L       | 0.019 <sup>a</sup>         |        |
| <b>Major Ions</b>                                      |            |                            |        |
| Total Dissolved Solids                                 | mg/L       | 742                        | 1672   |
| Sulphate Dissolved                                     | mg/L       | 250                        |        |
| Sodium Dissolved                                       | mg/L       | 164                        | 442    |
| Fluoride Dissolved                                     | mg/L       | 0.2                        | 0.29   |
| Chloride Dissolved                                     | mg/L       | 267                        | 728    |
| <b>Physicals and Other</b>                             |            |                            |        |
| pH Lab   | pH units   | 6.5-9.0                    |        |
| pH Field   | pH units   | 6.5-9.0                    |        |
| Oxygen Dissolved                                       |            |                            |        |
| Temperature > 5°C (Open Season)                        | mg/L       | 5                          |        |
| Temperature < 5°C (Closed Season)                      | mg/L       | No Objective               |        |
| Sodium Adsorption Ratio                                | rel units  | No Objective               |        |
| Total Suspended Solids                                 | mg/L       | 6.08 -98.2                 |        |
| Reactive Chlorine Species                              | mg/L       | 0.0005                     |        |
| Cyanide (free)   | mg/L       | 0.005                      |        |
|  |            |                            |        |
| E. Coli  | No./100 mL | 200                        |        |
| Coliforms Fecal  | No./100 mL | 100                        |        |
| <b>Metals</b>  |            |                            |        |
| Arsenic Total  | µg/L       | No Objective               |        |
| Arsenic Dissolved                                      | µg/L       | 50                         |        |
| Barium Total   | µg/L       | 1000                       |        |
| Beryllium Total  | µg/L       | 100                        |        |
| Boron Total  | µg/L       | 500                        |        |
| Cadmium Total  | µg/L       | Calculated <sup>b</sup>    |        |
| Chromium Total   | µg/L       | 50                         |        |
| Cobalt Total   | µg/L       | 50                         |        |
| Copper Total   | µg/L       | Calculated <sup>b</sup>    |        |
| Iron Dissolved   | µg/L       | 237.2                      | 2121.0 |
| Lead Total   | µg/L       | Calculated <sup>b</sup>    |        |
| Lithium Total  | µg/L       | 2500                       |        |
| Manganese Dissolved                                    | µg/L       | 271.8                      | 2014.0 |
| Mercury Total  | µg/L       | 0.026                      |        |
| Molybdenum Total                                       | µg/L       | 10                         |        |
| Nickel Dissolved                                       | µg/L       | Calculated <sup>b</sup>    |        |
| Selenium Total   | µg/L       | 1                          |        |
| Silver Total   | µg/L       | 0.25                       |        |
| Thallium Total   | µg/L       | 0.8                        |        |
| Uranium Total  | µg/L       | 10                         |        |
| Vanadium Total   | µg/L       | 100                        |        |
| Zinc Dissolved   | µg/L       | Calculated <sup>b</sup>    |        |



| <b>Pesticides</b>                           |                           |                   |
|---|---------------------------|-------------------|
| <i>Acid Herbicides</i>                      |                           |                   |
| 2,4-D                                       | µg/L                      | 4                 |
| Bromoxynil                                  | µg/L                      | 0.33              |
| Dicamba                                     | µg/L                      | 0.006             |
| MCPA  | µg/L                      | 0.025             |
| Picloram                                    | µg/L                      | 29                |
| <i>Organochlorine Pesticides in Water</i>   |                           |                   |
| Endosulfan                                  | µg/L                      | 0.003             |
| Hexachlorocyclohexane (gamma-HCH) (Lindane) | µg/L                      | 0.01              |
| Hexachlorobenzene                           | µg/L                      | 0.52              |
| Pentachlorophenol (PCP)                     | µg/L                      | 0.5               |
| <i>Neutral Herbicides in Water</i>          |                           |                   |
| Atrazine                                    | µg/L                      | 1.8               |
| Diclofopmethyl (Hoegrass)                   | µg/L                      | 0.18              |
| Metolachlor                                 | µg/L                      | 7.8               |
| Metribuzin                                  | µg/L                      | 0.5               |
| Simazine                                    | µg/L                      | 0.5               |
| Triallate                                   | µg/L                      | 0.24              |
| Trifluralin                                 | µg/L                      | 0.2               |
| <i>Other</i>                                |                           |                   |
| Glyphosate                                  | µg/L                      | Report Detections |
| AMPA  | µg/L                      | Report Detections |
| <b>Fish Tissue</b>                          |                           |                   |
| Mercury in fish (muscle tissue)             | µg/kg                     | 200               |
| Arsenic in fish (muscle tissue)             | µg/kg                     | 3500              |
| Lead in fish (muscle tissue)                | µg/kg                     | 500               |
| DDT (total) in fish (muscle tissue)         | µg/kg                     | 5000              |
| <b>Aquatic Biota Consumption</b>            |                           |                   |
| PCB in fish (muscle tissue) mammalian       | µg TEQ/kg diet wet weight | 0.00079           |
| PCB in fish (muscle tissue) avian           | µg TEQ/kg diet wet weight | 0.0024            |
| DDT (total) in fish (muscle tissue)         | µg/kg diet wet weight     | 14                |
| Toxaphene in fish (muscle tissue)           | µg/kg diet wet weight     | 6.3               |
| <b>Radioactive</b>                          |                           |                   |
| Cesium-137                                  | Bq/L                      | 10                |
| Iodine-131                                  | Bq/L                      | 6                 |
| Lead-210                                    | Bq/L                      | 0.2               |
| Radium-226                                  | Bq/L                      | 0.5               |
| Strontium-90                                | Bq/L                      | 5                 |
| Tritium                                     | Bq/L                      | 7000              |

|                              |
|------------------------------|
| Protection of Aquatic Life   |
| Ag-Livestock                 |
| Ag-Irrigation                |
| Recreation                   |
| Treatability                 |
| Ag-Irrigation + Treatability |
| Ag- Irrigation and Livestock |
| Fish Consumption             |
| Background                   |

### Superscripts

a. Ammonia objective: Expressed as mg unionized ammonia/L. This would be equivalent to 0.0156 mg ammonia-nitrogen/L (0.019\*14.0067/17.031).

b. The objective value in µg/L is a function of total hardness (CaCO<sub>3</sub> mg/L) in the water column: Cadmium Total is calculated using Cadmium =  $10^{(0.83(\log[\text{hardness}] - 2.46))}$ . Copper Total's objective is 2 when total hardness is <82 or unknown, 4 when >180, and calculated using  $0.2 * e^{(0.8545[\ln(\text{hardness})] - 1.465)}$  when total hardness is ≥82 to ≤180. Lead Total's objective is 1 when total hardness is ≤60 or unknown, 7 when >180, and calculated using  $e^{(1.273[\ln(\text{hardness})] - 4.705)}$  when total hardness is >60 to ≤180. Nickel Dissolved is calculated using  $0.998 * e^{(0.8460[\ln(\text{hardness})] + 2.255)}$ . Zinc dissolved is calculated using  $\text{Zinc} = \exp^{(0.947[\ln(\text{hardness mg-L}^{-1})] - 0.815[\text{pH}] + 0.398[\ln(\text{DOC mg-L}^{-1})] + 4.625)}$ .

Table 9

| WATER QUALITY OBJECTIVES – Updated 2021                  |            |                            |        |
|--|------------|----------------------------|--------|
| Red Deer River S/M Reach: Etomami River to Red Deer Lake |            |                            |        |
| Chemical, Physical or Biological Variable                | Unit       | Acceptable Limit or Limits |        |
| <b>Nutrients</b>   |            | Open                       | Closed |
| Total Phosphorus   | mg/L       | 0.052                      | 0.074  |
|  |            | 0.066                      | 0.161  |
| Total Dissolved Phosphorus                               | mg/L       | 0.021                      | 0.025  |
|  |            | 0.029                      | 0.055  |
| Total Nitrogen   | mg/L       | 1.195                      | 1.998  |
| Nitrate as N   | mg/L       | 3                          |        |
| Ammonia Un-ionized                                       | mg/L       | 0.019 <sup>a</sup>         |        |
| <b>Major Ions</b>  |            |                            |        |
| Total Dissolved Solids                                   | mg/L       | 500                        |        |
| Sulphate Dissolved                                       | mg/L       | 250                        |        |
| Sodium Dissolved   | mg/L       | 200                        |        |
| Fluoride Dissolved                                       | mg/L       | 0.18                       |        |
| Chloride Dissolved                                       | mg/L       | 100                        |        |
| <b>Physicals and Other</b>                               |            |                            |        |
| pH Lab   | pH units   | 6.5-9.0                    |        |
| pH Field   | pH units   | 6.5-9.0                    |        |
| Oxygen Dissolved   |            |                            |        |
| Temperature > 5°C (Open Season)                          | mg/L       | 5                          |        |
| Temperature < 5°C (Closed Season)                        | mg/L       | 3                          |        |
| Sodium Adsorption Ratio                                  | rel units  | 3                          |        |
| Total Suspended Solids                                   | mg/L       | 1.0 - 19.7                 |        |
| Reactive Chlorine Species                                | mg/L       | 0.0005                     |        |
| Cyanide (free)   | mg/L       | 0.005                      |        |
|  |            |                            |        |
| E. Coli  | No./100 mL | 200                        |        |
| Coliforms Fecal  | No./100 mL | 100                        |        |
| <b>Metals</b>  |            |                            |        |
| Arsenic Total  | µg/L       | 5                          |        |
| Arsenic Dissolved  | µg/L       | No Objective               |        |
| Barium Total   | µg/L       | 1000                       |        |
| Beryllium Total  | µg/L       | 100                        |        |
| Boron Total  | µg/L       | 500                        |        |
| Cadmium Total  | µg/L       | Calculated <sup>b</sup>    |        |
| Chromium Total   | µg/L       | 50                         |        |
| Cobalt Total   | µg/L       | 50                         |        |
| Copper Total   | µg/L       | Calculated <sup>b</sup>    |        |
| Iron Dissolved   | µg/L       | 300                        |        |
| Lead Total   | µg/L       | Calculated <sup>b</sup>    |        |
| Lithium Total  | µg/L       | 2500                       |        |
| Manganese Dissolved                                      | µg/L       | 50                         |        |
| Mercury Total  | µg/L       | 0.026                      |        |
| Molybdenum Total   | µg/L       | 10                         |        |
| Nickel Dissolved   | µg/L       | Calculated <sup>b</sup>    |        |
| Selenium Total   | µg/L       | 1                          |        |
| Silver Total   | µg/L       | 0.25                       |        |
| Thallium Total   | µg/L       | 0.8                        |        |
| Uranium Total  | µg/L       | 10                         |        |
| Vanadium Total   | µg/L       | 100                        |        |
| Zinc Dissolved   | µg/L       | Calculated <sup>b</sup>    |        |

| <b>Pesticides</b>                           |                           |                   |
|---|---------------------------|-------------------|
| <i>Acid Herbicides</i>                      |                           |                   |
| 2,4-D                                       | µg/L                      | 4                 |
| Bromoxynil                                  | µg/L                      | 0.33              |
| Dicamba                                     | µg/L                      | 0.006             |
| MCPA  | µg/L                      | 0.025             |
| Picloram                                    | µg/L                      | 29                |
| <i>Organochlorine Pesticides in Water</i>   |                           |                   |
| Endosulfan                                  | µg/L                      | 0.003             |
| Hexachlorocyclohexane (gamma-HCH) (Lindane) | µg/L                      | 0.01              |
| Hexachlorobenzene                           | µg/L                      | 0.52              |
| Pentachlorophenol (PCP)                     | µg/L                      | 0.5               |
| <i>Neutral Herbicides in Water</i>          |                           |                   |
| Atrazine                                    | µg/L                      | 1.8               |
| Diclofopmethyl (Hoegrass)                   | µg/L                      | 0.18              |
| Metolachlor                                 | µg/L                      | 7.8               |
| Metribuzin                                  | µg/L                      | 0.5               |
| Simazine                                    | µg/L                      | 0.5               |
| Triallate                                   | µg/L                      | 0.24              |
| Trifluralin                                 | µg/L                      | 0.2               |
| <i>Other</i>                                |                           |                   |
| Glyphosate                                  | µg/L                      | Report Detections |
| <b>Fish Tissue</b>                          |                           |                   |
| Mercury in fish (muscle tissue)             | µg/kg                     | 200               |
| Arsenic in fish (muscle tissue)             | µg/kg                     | 3500              |
| Lead in fish (muscle tissue)                | µg/kg                     | 500               |
| DDT (total) in fish (muscle tissue)         | µg/kg                     | 5000              |
| <b>Aquatic Biota Consumption</b>            |                           |                   |
| PCB in fish (muscle tissue) mammalian       | µg TEQ/kg diet wet weight | 0.00079           |
| PCB in fish (muscle tissue) avian           | µg TEQ/kg diet wet weight | 0.0024            |
| DDT (total) in fish (muscle tissue)         | µg/kg diet wet weight     | 14                |
| Toxaphene in fish (muscle tissue)           | µg/kg diet wet weight     | 6.3               |
| <b>Radioactive</b>                          |                           |                   |
| Cesium-137                                  | Bq/L                      | 10                |
| Iodine-131                                  | Bq/L                      | 6                 |
| Lead-210                                    | Bq/L                      | 0.2               |
| Radium-226                                  | Bq/L                      | 0.5               |
| Strontium-90                                | Bq/L                      | 5                 |
| Tritium                                     | Bq/L                      | 7000              |

|                              |
|------------------------------|
| Protection of Aquatic Life   |
| Ag-Livestock                 |
| Ag-Irrigation                |
| Recreation                   |
| Treatability                 |
| Ag-Irrigation + Treatability |
| Ag- Irrigation and Livestock |
| Fish Consumption             |
| Background                   |

### Superscripts

a. Ammonia objective: Expressed as mg unionized ammonia/L. This would be equivalent to 0.0156 mg ammonia-nitrogen/L (0.019\*14.0067/17.031).

b. The objective value in µg/L is a function of total hardness (CaCO<sub>3</sub> mg/L) in the water column: Cadmium Total is calculated using Cadmium =  $10^{(0.83(\log[\text{hardness}]) - 2.46)}$ . Copper Total's objective is 2 when total hardness is <82 or unknown, 4 when >180, and calculated using  $0.2 * e^{(0.8545[\ln(\text{hardness})] - 1.465)}$  when total hardness is ≥82 to ≤180. Lead Total's objective is 1 when total hardness is ≤60 or unknown, 7 when >180, and calculated using  $e^{(1.273[\ln(\text{hardness})] - 4.705)}$  when total hardness is >60 to ≤180. Nickel Dissolved is calculated using  $0.998 * e^{(0.8460[\ln(\text{hardness})] + 2.255)}$ . Zinc dissolved is calculated using  $Zinc = \exp^{(0.947[\ln(\text{hardness mg-L}^{-1})] - 0.815[\text{pH}] + 0.398[\ln(\text{DOC mg-L}^{-1})] + 4.625)}$ .

Table 10

| WATER QUALITY OBJECTIVES – Updated 2021                                    |            |                            |        |
|--|------------|----------------------------|--------|
| Assiniboine River Reach: Whitesand River to Outlet of Shellmouth Reservoir |            |                            |        |
| Chemical, Physical or Biological Variable                                  | Unit       | Acceptable Limit or Limits |        |
| <b>Nutrients</b>   |            | Open                       | Closed |
| Total Phosphorus   | mg/L       | 0.311                      | 0.180  |
| Total Dissolved Phosphorus   | mg/L       | 0.186                      | 0.115  |
| Total Nitrogen   | mg/L       | 1.801                      | 2.252  |
| Nitrate as N   | mg/L       | 3                          |        |
| Ammonia Un-ionized   | mg/L       | 0.019 <sup>a</sup>         |        |
| <b>Major Ions</b>  |            |                            |        |
| Total Dissolved Solids   | mg/L       | 834                        |        |
| Sulphate Dissolved   | mg/L       | 299                        |        |
| Sodium Dissolved   | mg/L       | 200                        |        |
| Fluoride Dissolved   | mg/L       | 0.26                       |        |
| Chloride Dissolved   | mg/L       | 100                        |        |
| <b>Physicals and Other</b>   |            |                            |        |
| pH Lab   | pH units   | 6.5-9.0                    |        |
| pH Field   | pH units   | 6.5-9.0                    |        |
| Oxygen Dissolved   |            |                            |        |
| Temperature > 5°C (Open Season)  | mg/L       | 5                          |        |
| Temperature < 5°C (Closed Season)  | mg/L       | 3                          |        |
| Sodium Adsorption Ratio  | rel units  | 3                          |        |
| Total Suspended Solids   | mg/L       | 5.0-69.2                   |        |
| Reactive Chlorine Species  | mg/L       | 0.0005                     |        |
| Cyanide (free)   | mg/L       | 0.005                      |        |
| <b>Biota</b>   |            |                            |        |
| E. Coli  | No./100 mL | 200                        |        |
| Coliforms Fecal  | No./100 mL | 100                        |        |
| <b>Metals</b>  |            |                            |        |
| Arsenic Total  | µg/L       | 5                          |        |
| Arsenic Dissolved  | µg/L       | No Objective               |        |
| Barium Total   | µg/L       | 1000                       |        |
| Beryllium Total  | µg/L       | 100                        |        |
| Boron Total  | µg/L       | 500                        |        |
| Cadmium Total  | µg/L       | Calculated <sup>b</sup>    |        |
| Chromium Total   | µg/L       | 50                         |        |
| Cobalt Total   | µg/L       | 50                         |        |
| Copper Total   | µg/L       | Calculated <sup>b</sup>    |        |
| Iron Dissolved   | µg/L       | 300                        |        |
| Lead Total   | µg/L       | Calculated <sup>b</sup>    |        |
| Lithium Total  | µg/L       | 2500                       |        |
| Manganese Dissolved  | µg/L       | 224.8                      | 329.0  |
| Mercury Total  | µg/L       | 0.026                      |        |
| Molybdenum Total   | µg/L       | 10                         |        |
| Nickel Dissolved   | µg/L       | Calculated <sup>b</sup>    |        |
| Selenium Total   | µg/L       | 1                          |        |
| Silver Total   | µg/L       | 0.25                       |        |
| Thallium Total   | µg/L       | 0.8                        |        |
| Uranium Total  | µg/L       | 10                         |        |
| Vanadium Total   | µg/L       | 100                        |        |
| Zinc Dissolved   | µg/L       | Calculated <sup>b</sup>    |        |

| <b>Pesticides</b>                           |                           |                   |
|---|---------------------------|-------------------|
| <i>Acid Herbicides</i>                      |                           |                   |
| 2,4-D                                       | µg/L                      | 4                 |
| Bromoxynil                                  | µg/L                      | 0.33              |
| Dicamba                                     | µg/L                      | 0.006             |
| MCPA  | µg/L                      | 0.025             |
| Picloram                                    | µg/L                      | 29                |
| <i>Organochlorine Pesticides in Water</i>   |                           |                   |
| Endosulfan                                  | µg/L                      | 0.003             |
| Hexachlorocyclohexane (gamma-HCH) (Lindane) | µg/L                      | 0.01              |
| Hexachlorobenzene                           | µg/L                      | 0.52              |
| Pentachlorophenol (PCP)                     | µg/L                      | 0.5               |
| <i>Neutral Herbicides in Water</i>          |                           |                   |
| Atrazine                                    | µg/L                      | 1.8               |
| Diclofopmethyl (Hoegrass)                   | µg/L                      | 0.18              |
| Metolachlor                                 | µg/L                      | 7.8               |
| Metribuzin                                  | µg/L                      | 0.5               |
| Simazine                                    | µg/L                      | 0.5               |
| Triallate                                   | µg/L                      | 0.24              |
| Trifluralin                                 | µg/L                      | 0.2               |
| <i>Other</i>                                |                           |                   |
| Glyphosate                                  | µg/L                      | Report Detections |
| AMPA  | µg/L                      | Report Detections |
| <b>Fish Tissue</b>                          |                           |                   |
| Mercury in fish (muscle tissue)             | µg/kg                     | 200               |
| Arsenic in fish (muscle tissue)             | µg/kg                     | 3500              |
| Lead in fish (muscle tissue)                | µg/kg                     | 500               |
| DDT (total) in fish (muscle tissue)         | µg/kg                     | 5000              |
| <b>Aquatic Biota Consumption</b>            |                           |                   |
| PCB in fish (muscle tissue) mammalian       | µg TEQ/kg diet wet weight | 0.00079           |
| PCB in fish (muscle tissue) avian           | µg TEQ/kg diet wet weight | 0.0024            |
| DDT (total) in fish (muscle tissue)         | µg/kg diet wet weight     | 14                |
| Toxaphene in fish (muscle tissue)           | µg/kg diet wet weight     | 6.3               |
| <b>Radioactive</b>                          |                           |                   |
| Cesium-137                                  | Bq/L                      | 10                |
| Iodine-131                                  | Bq/L                      | 6                 |
| Lead-210                                    | Bq/L                      | 0.2               |
| Radium-226                                  | Bq/L                      | 0.5               |
| Strontium-90                                | Bq/L                      | 5                 |
| Tritium                                     | Bq/L                      | 7000              |

|                              |
|------------------------------|
| Protection of Aquatic Life   |
| Ag-Livestock                 |
| Ag-Irrigation                |
| Recreation                   |
| Treatability                 |
| Ag-Irrigation + Treatability |
| Ag- Irrigation and Livestock |
| Fish Consumption             |
| Background                   |

### Superscripts

a. Ammonia objective: Expressed as mg unionized ammonia/L. This would be equivalent to 0.0156 mg ammonia-nitrogen/L (0.019\*14.0067/17.031).

b. The objective value in µg/L is a function of total hardness (CaCO<sub>3</sub> mg/L) in the water column: Cadmium Total is calculated using Cadmium =  $10^{(0.83(\log[\text{hardness}]) - 2.46)}$ . Copper Total's objective is 2 when total hardness is <82 or unknown, 4 when >180, and calculated using  $0.2 * e^{(0.8545[\ln(\text{hardness})] - 1.465)}$  when total hardness is ≥82 to ≤180. Lead Total's objective is 1 when total hardness is ≤60 or unknown, 7 when >180, and calculated using  $e^{(1.273[\ln(\text{hardness})] - 4.705)}$  when total hardness is >60 to ≤180. Nickel Dissolved is calculated using  $0.998 * e^{(0.8460[\ln(\text{hardness})] + 2.255)}$ . Zinc dissolved is calculated using  $\text{Zinc} = \exp^{(0.947[\ln(\text{hardness mg-L}^{-1})] - 0.815[\text{pH}] + 0.398[\ln(\text{DOC mg-L}^{-1})] + 4.625)}$ .

Table 11

| WATER QUALITY OBJECTIVES – Updated 2021                     |            |                            |        |
|---|------------|----------------------------|--------|
| Qu'Appelle River Reach: Kaposvar Creek to Assiniboine River |            |                            |        |
| Chemical, Physical or Biological Variable                   | Unit       | Acceptable Limit or Limits |        |
| <b>Nutrients</b>  |            | Open                       | Closed |
| Total Phosphorus  | mg/L       | 0.278                      | 0.221  |
|   |            | 0.304                      | 0.290  |
| Total Dissolved Phosphorus                                  | mg/L       | 0.156                      | 0.129  |
|   |            | 0.190                      | 0.249  |
| Total Nitrogen  | mg/L       | 1.822                      | 1.767  |
| Nitrate as N  | mg/L       | 3                          |        |
| Ammonia Un-ionized  | mg/L       | 0.019 <sup>a</sup>         |        |
| <b>Major Ions</b>   |            |                            |        |
| Total Dissolved Solids                                      | mg/L       | 1144                       |        |
| Sulphate Dissolved  | mg/L       | 486                        |        |
| Sodium Dissolved  | mg/L       | 200                        |        |
| Fluoride Dissolved  | mg/L       | 0.25                       |        |
| Chloride Dissolved  | mg/L       | 100                        |        |
| <b>Physicals and Other</b>                                  |            |                            |        |
| pH Lab  | pH units   | 6.5-9.0                    |        |
| pH Field  | pH units   | 6.5-9.0                    |        |
| Oxygen Dissolved  |            |                            |        |
| Temperature > 5°C (Open Season)                             | mg/L       | 5                          |        |
| Temperature < 5°C (Closed Season)                           | mg/L       | 3                          |        |
| Sodium Adsorption Ratio                                     | rel units  | No Objective               |        |
| Total Suspended Solids                                      | mg/L       | 22.6 -122.2                |        |
| Reactive Chlorine Species                                   | mg/L       | 0.0005                     |        |
| Cyanide (free)  | mg/L       | 0.005                      |        |
|   |            |                            |        |
| E. Coli   | No./100 mL | 200                        |        |
| Coliforms Fecal   | No./100 mL | 100                        |        |
| <b>Metals</b>   |            |                            |        |
| Arsenic Total   | µg/L       | No Objective               |        |
| Arsenic Dissolved   | µg/L       | 50                         |        |
| Barium Total  | µg/L       | 1000                       |        |
| Beryllium Total   | µg/L       | 100                        |        |
| Boron Total   | µg/L       | 500                        |        |
| Cadmium Total   | µg/L       | Calculated <sup>b</sup>    |        |
| Chromium Total  | µg/L       | 50                         |        |
| Cobalt Total  | µg/L       | 50                         |        |
| Copper Total  | µg/L       | Calculated <sup>b</sup>    |        |
| Iron Dissolved  | µg/L       | 300                        |        |
| Lead Total  | µg/L       | Calculated <sup>b</sup>    |        |
| Lithium Total   | µg/L       | 2500                       |        |
| Manganese Dissolved   | µg/L       | 93.8                       | 116.8  |
| Mercury Total   | µg/L       | 0.026                      |        |
| Molybdenum Total  | µg/L       | 10                         |        |
| Nickel Dissolved  | µg/L       | Calculated <sup>b</sup>    |        |
| Selenium Total  | µg/L       | 1                          |        |
| Silver Total  | µg/L       | 0.25                       |        |
| Thallium Total  | µg/L       | 0.8                        |        |
| Uranium Total   | µg/L       | 10                         |        |
| Vanadium Total  | µg/L       | 100                        |        |
| Zinc Dissolved  | µg/L       | Calculated <sup>b</sup>    |        |

| <b>Pesticides</b>                           |                           |                   |
|---|---------------------------|-------------------|
| <i>Acid Herbicides</i>                      |                           |                   |
| 2,4-D                                       | µg/L                      | 4                 |
| Bromoxynil                                  | µg/L                      | 0.33              |
| Dicamba                                     | µg/L                      | 0.006             |
| MCPA  | µg/L                      | 0.025             |
| Picloram                                    | µg/L                      | 29                |
| <i>Organochlorine Pesticides in Water</i>   |                           |                   |
| Endosulfan                                  | µg/L                      | 0.003             |
| Hexachlorocyclohexane (gamma-HCH) (Lindane) | µg/L                      | 0.01              |
| Hexachlorobenzene                           | µg/L                      | 0.52              |
| Pentachlorophenol (PCP)                     | µg/L                      | 0.5               |
| <i>Neutral Herbicides in Water</i>          |                           |                   |
| Atrazine                                    | µg/L                      | 1.8               |
| Diclofopmethyl (Hoegrass)                   | µg/L                      | 0.18              |
| Metolachlor                                 | µg/L                      | 7.8               |
| Metribuzin                                  | µg/L                      | 0.5               |
| Simazine                                    | µg/L                      | 0.5               |
| Triallate                                   | µg/L                      | 0.24              |
| Trifluralin                                 | µg/L                      | 0.2               |
| <i>Other</i>                                |                           |                   |
| Glyphosate                                  | µg/L                      | Report Detections |
| AMPA  | µg/L                      | Report Detections |
| <b>Fish Tissue</b>                          |                           |                   |
| Mercury in fish (muscle tissue)             | µg/kg                     | 200               |
| Arsenic in fish (muscle tissue)             | µg/kg                     | 3500              |
| Lead in fish (muscle tissue)                | µg/kg                     | 500               |
| DDT (total) in fish (muscle tissue)         | µg/kg                     | 5000              |
| <b>Aquatic Biota Consumption</b>            |                           |                   |
| PCB in fish (muscle tissue) mammalian       | µg TEQ/kg diet wet weight | 0.00079           |
| PCB in fish (muscle tissue) avian           | µg TEQ/kg diet wet weight | 0.0024            |
| DDT (total) in fish (muscle tissue)         | µg/kg diet wet weight     | 14                |
| Toxaphene in fish (muscle tissue)           | µg/kg diet wet weight     | 6.3               |
| <b>Radioactive</b>                          |                           |                   |
| Cesium-137                                  | Bq/L                      | 10                |
| Iodine-131                                  | Bq/L                      | 6                 |
| Lead-210                                    | Bq/L                      | 0.2               |
| Radium-226                                  | Bq/L                      | 0.5               |
| Strontium-90                                | Bq/L                      | 5                 |
| Tritium                                     | Bq/L                      | 7000              |

|                              |
|------------------------------|
| Protection of Aquatic Life   |
| Ag-Livestock                 |
| Ag-Irrigation                |
| Recreation                   |
| Treatability                 |
| Ag-Irrigation + Treatability |
| Ag- Irrigation and Livestock |
| Fish Consumption             |
| Background                   |

### Superscripts

a. Ammonia objective: Expressed as mg unionized ammonia/L. This would be equivalent to 0.0156 mg ammonia-nitrogen/L (0.019\*14.0067/17.031).

b. The objective value in µg/L is a function of total hardness (CaCO<sub>3</sub> mg/L) in the water column: Cadmium Total is calculated using Cadmium =  $10^{(0.83(\log[\text{hardness}]) - 2.46)}$ . Copper Total's objective is 2 when total hardness is <82 or unknown, 4 when >180, and calculated using  $0.2 * e^{(0.8545[\ln(\text{hardness})] - 1.465)}$  when total hardness is ≥82 to ≤180. Lead Total's objective is 1 when total hardness is ≤60 or unknown, 7 when >180, and calculated using  $e^{(1.273[\ln(\text{hardness})] - 4.705)}$  when total hardness is >60 to ≤180. Nickel Dissolved is calculated using  $0.998 * e^{(0.8460[\ln(\text{hardness})] + 2.255)}$ . Zinc dissolved is calculated using  $\text{Zinc} = \exp^{(0.947[\ln(\text{hardness mg-L}^{-1})] - 0.815[\text{pH}] + 0.398[\ln(\text{DOC mg-L}^{-1})] + 4.625)}$ .

Table 12

| WATER QUALITY OBJECTIVES – Updated 2021   |            |                            |        |
|---|------------|----------------------------|--------|
| Cold River Reach: Outlet of Cold Lake     |            |                            |        |
| Chemical, Physical or Biological Variable | Unit       | Acceptable Limit or Limits |        |
|   |            | Open                       | Closed |
| <b>Nutrients</b>                          |            |                            |        |
| Total Phosphorus                          | mg/L       | 0.023                      | 0.024  |
| Total Dissolved Phosphorus                | mg/L       | 0.010                      | 0.017  |
| Total Nitrogen                            | mg/L       | 0.453                      | 0.452  |
|   |            | 0.460                      | 0.467  |
| Nitrate as N                              | mg/L       | 3                          |        |
| Ammonia Un-ionized                        | mg/L       | 0.019 <sup>a</sup>         |        |
| <b>Major Ions</b>                         |            |                            |        |
| Total Dissolved Solids                    | mg/L       | 500                        |        |
| Sulphate Dissolved                        | mg/L       | 250                        |        |
| Sodium Dissolved                          | mg/L       | 200                        |        |
| Fluoride Dissolved                        | mg/L       | 0.12                       |        |
| Chloride Dissolved                        | mg/L       | 100                        |        |
| <b>Physicals and Other</b>                |            |                            |        |
| pH Lab                                    | pH units   | 6.5-9.0                    |        |
| pH Field                                  | pH units   | 6.5-9.0                    |        |
| Oxygen Dissolved                          |            |                            |        |
| Temperature > 5°C (Open Season)           | mg/L       | 5                          |        |
| Temperature < 5°C (Closed Season)         | mg/L       | 3                          |        |
| Sodium Adsorption Ratio                   | rel units  | 3                          |        |
| Total Suspended Solids                    | mg/L       | 1.2-4.8                    |        |
| Reactive Chlorine Species                 | mg/L       | 0.0005                     |        |
| Cyanide (free)                            | mg/L       | 0.005                      |        |
| <b>Bacteria</b>                           |            |                            |        |
| E. Coli                                   | No./100 mL | 200                        |        |
| Coliforms Fecal                           | No./100 mL | 100                        |        |
| <b>Metals</b>                             |            |                            |        |
| Arsenic Total                             | µg/L       | 5                          |        |
| Arsenic Dissolved                         | µg/L       | No Objective               |        |
| Barium Total                              | µg/L       | 1000                       |        |
| Beryllium Total                           | µg/L       | 100                        |        |
| Boron Total                               | µg/L       | 500                        |        |
| Cadmium Total                             | µg/L       | Calculated <sup>b</sup>    |        |
| Chromium Total                            | µg/L       | 50                         |        |
| Cobalt Total                              | µg/L       | 50                         |        |
| Copper Total                              | µg/L       | Calculated <sup>b</sup>    |        |
| Iron Dissolved                            | µg/L       | 300                        |        |
| Lead Total                                | µg/L       | Calculated <sup>b</sup>    |        |
| Lithium Total                             | µg/L       | 2500                       |        |
| Manganese Dissolved                       | µg/L       | 50                         |        |
| Mercury Total                             | µg/L       | 0.026                      |        |
| Molybdenum Total                          | µg/L       | 10                         |        |
| Nickel Dissolved                          | µg/L       | Calculated <sup>b</sup>    |        |
| Selenium Total                            | µg/L       | 1                          |        |
| Silver Total                              | µg/L       | 0.25                       |        |
| Thallium Total                            | µg/L       | 0.8                        |        |
| Uranium Total                             | µg/L       | 10                         |        |
| Vanadium Total                            | µg/L       | 100                        |        |
| Zinc Dissolved                            | µg/L       | Calculated <sup>b</sup>    |        |



| <b>Pesticides</b>                           |                           |                   |
|---|---------------------------|-------------------|
| <i>Acid Herbicides</i>                      |                           |                   |
| 2,4-D                                       | µg/L                      | 4                 |
| Bromoxynil                                  | µg/L                      | 0.33              |
| Dicamba                                     | µg/L                      | 0.006             |
| MCPA  | µg/L                      | 0.025             |
| Picloram                                    | µg/L                      | 29                |
| <i>Organochlorine Pesticides in Water</i>   |                           |                   |
| Endosulfan                                  | µg/L                      | 0.003             |
| Hexachlorocyclohexane (gamma-HCH) (Lindane) | µg/L                      | 0.01              |
| Hexachlorobenzene                           | µg/L                      | 0.52              |
| Pentachlorophenol (PCP)                     | µg/L                      | 0.5               |
| <i>Neutral Herbicides in Water</i>          |                           |                   |
| Atrazine                                    | µg/L                      | 1.8               |
| Diclofopmethyl (Hoegrass)                   | µg/L                      | 0.18              |
| Metolachlor                                 | µg/L                      | 7.8               |
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| Simazine                                    | µg/L                      | 0.5               |
| Triallate                                   | µg/L                      | 0.24              |
| Trifluralin                                 | µg/L                      | 0.2               |
| <i>Other</i>                                |                           |                   |
| Glyphosate                                  | µg/L                      | Report Detections |
| AMPA  | µg/L                      | Report Detections |
| <b>Fish Tissue</b>                          |                           |                   |
| Mercury in fish (muscle tissue)             | µg/kg                     | 200               |
| Arsenic in fish (muscle tissue)             | µg/kg                     | 3500              |
| Lead in fish (muscle tissue)                | µg/kg                     | 500               |
| DDT (total) in fish (muscle tissue)         | µg/kg                     | 5000              |
| <b>Aquatic Biota Consumption</b>            |                           |                   |
| PCB in fish (muscle tissue) mammalian       | µg TEQ/kg diet wet weight | 0.00079           |
| PCB in fish (muscle tissue) avian           | µg TEQ/kg diet wet weight | 0.0024            |
| DDT (total) in fish (muscle tissue)         | µg/kg diet wet weight     | 14                |
| Toxaphene in fish (muscle tissue)           | µg/kg diet wet weight     | 6.3               |
| <b>Radioactive</b>                          |                           |                   |
| Cesium-137                                  | Bq/L                      | 10                |
| Iodine-131                                  | Bq/L                      | 6                 |
| Lead-210                                    | Bq/L                      | 0.2               |
| Radium-226                                  | Bq/L                      | 0.5               |
| Strontium-90                                | Bq/L                      | 5                 |
| Tritium                                     | Bq/L                      | 7000              |

|                              |
|------------------------------|
| Protection of Aquatic Life   |
| Ag-Livestock                 |
| Ag-Irrigation                |
| Recreation                   |
| Treatability                 |
| Ag-Irrigation + Treatability |
| Ag- Irrigation and Livestock |
| Fish Consumption             |
| Background                   |

### Superscripts

a. Ammonia objective: Expressed as mg unionized ammonia/L. This would be equivalent to 0.0156 mg ammonia-nitrogen/L (0.019\*14.0067/17.031).

b. The objective value in µg/L is a function of total hardness (CaCO<sub>3</sub> mg/L) in the water column: Cadmium Total is calculated using Cadmium =  $10^{(0.83(\log[\text{hardness}] - 2.46))}$ . Copper Total's objective is 2 when total hardness is <82 or unknown, 4 when >180, and calculated using  $0.2 * e^{(0.8545[\ln(\text{hardness})] - 1.465)}$  when total hardness is ≥82 to ≤180. Lead Total's objective is 1 when total hardness is ≤60 or unknown, 7 when >180, and calculated using  $e^{(1.273[\ln(\text{hardness})] - 4.705)}$  when total hardness is >60 to ≤180. Nickel Dissolved is calculated using  $0.998 * e^{(0.8460[\ln(\text{hardness})] + 2.255)}$ . Zinc dissolved is calculated using  $\text{Zinc} = \exp^{(0.947[\ln(\text{hardness mg-L}^{-1})] - 0.815[\text{pH}] + 0.398[\ln(\text{DOC mg-L}^{-1})] + 4.625)}$ .