



PRAIRIE PROVINCES WATER BOARD

Report #179

Appendices F to H **Long-Term Trends in Water Quality Parameters** **At Twelve Transboundary River Reaches** **(From the beginning of the data record until the end of 2013)**

Prepared for the Prairie Provinces Water Board
By the Committee on Water Quality

March 2018

Appendix F: Trending Summary Table

Table F1: Trending Summary for Battle River – Flow-Weighted Trend

Parameter	Z Critical = 1.960				Rank Von Neumann (alpha=0.05)
	n	Z Calc	p<0.05	Slope (units/yr)	
Nutrients					
Ammonia Dissolved	392	-3.318	Sig	-0.0005093	Yes
Nitrate as N	565	-5.274	Sig	-0.00003993	Yes
Nitrogen Total	234	1.48	Not Sig	0.00603	Yes
Phosphorous Total	480	7.576	Sig	0.0009036	Yes
Phosphorous Total Dissolved	453	3.389	Sig	0.0001449	Yes
Major Ions					
Chloride Dissolved	567	14.72	Sig	0.3286	Yes
Fluoride Dissolved	513	4.174	Sig	0.0006657	Yes
Sodium Dissolved/Filtered	567	6.618	Sig	0.5205	Yes
Sulphate Dissolved	566	5.287	Sig	0.5152	Yes
Total Dissolved Solids (TDS)	388	9.132	Sig	4.246	Yes
Physicals					
Oxygen Dissolved	473	1.521	Not Sig	0.024	Yes
pH – Field	474	5.537	Sig	0.00825	Yes
Sodium Adsorption Ratio (SAR)	458	2.957	Sig	0.008774	Yes
Total Suspended Solids (TSS)	497	6.449	Sig	0.2706	Yes
Metals					
Aluminum Dissolved	128	-0.1254	Not Sig	-0.008388	Yes
Aluminum Total	128	-2.809	Sig	-9.016	Yes
Arsenic Dissolved	128	-1.324	Not Sig	-0.02895	Yes
Arsenic Total	128	-2.194	Sig	-0.05309	Yes
Barium Dissolved	128	2.841	Sig	1.878	Yes
Barium Total	128	1.038	Not Sig	0.8148	Yes
Beryllium Dissolved	128	9.277	Sig	0.0008492	Yes
Beryllium Total	128	2.667	Sig	0.0009912	Yes
Boron Dissolved	128	-1.822	Not Sig	-2.172	Yes
Boron Total	128	-1.99	Sig	-2.464	Yes
Cadmium Dissolved	128	7.253	Sig	0.00287	Yes
Cadmium Total	128	2.128	Sig	0.0008986	Yes
Chromium Dissolved	128	2.389	Sig	0.001721	Yes
Chromium Total	128	-1.922	Not Sig	-0.01142	Yes
Cobalt Dissolved	128	-1.623	Not Sig	-0.003761	Yes
Cobalt Total	128	-2.548	Sig	-0.01751	Yes
Copper Dissolved	128	0.5681	Not Sig	0.008433	Yes
Copper Total	128	-0.9557	Not Sig	-0.02597	Yes
Iron Dissolved	128	-1.677	Not Sig	-1.005	Yes
Iron Total	128	-0.2245	Not Sig	-2.747	Yes
Lead Dissolved	128	-2.165	Sig	-0.001466	Yes
Lead Total	128	-1.359	Not Sig	-0.007194	Yes
Lithium Dissolved	128	-0.69	Not Sig	-0.2867	Yes
Lithium Total	128	-0.3996	Not Sig	-0.1864	Yes

Manganese Dissolved	128	1.168	Not Sig	0.3524	Yes
Manganese Total	128	0.241	Not Sig	0.6137	Yes
Molybdenum Dissolved	128	-1.349	Not Sig	-0.01133	Yes
Molybdenum Total	128	0.6756	Not Sig	0.005849	Yes
Nickel Dissolved	128	0.8651	Not Sig	0.02021	Yes
Nickel Total	128	-0.3646	Not Sig	-0.01545	Yes
Selenium Dissolved	128	2.508	Sig	0.003737	No
Selenium Total	128	1.79	Not Sig	0.003398	No
Silver Dissolved	128	-0.9434	Not Sig	-0.000003707	Yes
Silver Total	128	-2.671	Sig	-0.00034	Yes
Thallium Dissolved	128	6.211	Sig	0.0007475	Yes
Thallium Total	128	2.449	Sig	0.0004779	No
Uranium Dissolved	128	4.165	Sig	0.03631	Yes
Uranium Total	128	4.099	Sig	0.03484	Yes
Vanadium Dissolved	128	-1.653	Not Sig	-0.01714	Yes
Vanadium Total	128	-2.876	Sig	-0.06618	Yes
Zinc Dissolved	128	1.305	Not Sig	0.0201	Yes
Zinc Total	128	-1.557	Not Sig	-0.06133	Yes

	No Seasonality
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Table F2: Trending Summary for Beaver River – Flow-Weighted Trend

Parameter	Z Critical = 1.960				Rank Von Neumann (alpha=0.05)
	n	Z Calc	p<0.05	Slope (units/yr)	
Nutrients					
Ammonia Dissolved	352	-2.076	Sig	-0.0004524	Yes
Nitrate as N	474	-6.595	Sig	-0.0009144	Yes
Nitrogen Total	211	0.2516	Not Sig	0.0006401	Yes
Phosphorous Total	444	-1.8	Not Sig	-0.0002256	Yes
Phosphorous Total Dissolved	416	-7.849	Sig	-0.000406	Yes
Major Ions					
Chloride Dissolved	446	-2.997	Sig	-0.0129	Yes
Fluoride Dissolved	432	-6.238	Sig	-0.0006128	Yes
Sodium Dissolved/Filtered	447	-6.924	Sig	-0.08181	Yes
Sulphate Dissolved	447	-8.38	Sig	-0.1568	Yes
Total Dissolved Solids (TDS)	312	-2.156	Sig	-0.3385	Yes
Physicals					
Oxygen Dissolved	428	0.4863	Not Sig	0.007462	Yes
pH – Field	429	5.768	Sig	0.008623	Yes
Sodium Adsorption Ratio (SAR)	393	-4.334	Sig	-0.001657	Yes
Total Suspended Solids (TSS)	447	3.426	Sig	0.06844	Yes
Metals					
Aluminum Dissolved	120	1.184	Not Sig	0.04938	No
Aluminum Total	120	-1.08	Not Sig	-1.069	Yes
Arsenic Dissolved	120	-0.04757	Not Sig	-0.0002231	Yes
Arsenic Total	120	-0.147	Not Sig	-0.00105	Yes
Barium Dissolved	120	0.1773	Not Sig	0.05223	Yes
Barium Total	120	0.09514	Not Sig	0.01817	Yes
Beryllium Dissolved	120	5.271	Sig	0.0003153	Yes
Beryllium Total	120	3.523	Sig	0.0004708	Yes
Boron Dissolved	120	0.6986	Not Sig	0.1347	Yes
Boron Total	120	0.8052	Not Sig	0.1716	Yes
Cadmium Dissolved	120	9.347	Sig	0.004304	Yes
Cadmium Total	120	4.344	Sig	0.001367	Yes
Chromium Dissolved	120	2.164	Sig	0.001084	Yes
Chromium Total	120	0.3289	Not Sig	0.001475	Yes
Cobalt Dissolved	120	-0.4491	Not Sig	-0.0004519	Yes
Cobalt Total	120	-0.9209	Not Sig	-0.002703	Yes
Copper Dissolved	120	3.362	Sig	0.01336	Yes
Copper Total	120	1.581	Not Sig	0.009634	Yes
Iron Dissolved	120	0.2019	Not Sig	0.6799	Yes
Iron Total	120	0.1679	Not Sig	1.104	Yes
Lead Dissolved	120	0.3244	Not Sig	0.0001488	No
Lead Total	120	-0.05217	Not Sig	-0.00008863	Yes
Lithium Dissolved	120	0.7525	Not Sig	0.03971	Yes
Lithium Total	120	1.15	Not Sig	0.06551	Yes
Manganese Dissolved	120	1.176	Not Sig	0.7816	Yes

Manganese Total	120	-1.161	Not Sig	-2.391	Yes
Molybdenum Dissolved	120	-0.5149	Not Sig	-0.001819	Yes
Molybdenum Total	120	0.05444	Not Sig	0.0003424	Yes
Nickel Dissolved	120	1.297	Not Sig	0.00622	Yes
Nickel Total	120	-0.0431	Not Sig	-0.0002493	Yes
Selenium Dissolved	120	1.111	Not Sig	0	Yes
Selenium Total	120	0.7032	Not Sig	0.0005721	Yes
Silver Total	120	-2.106	Sig	-0.00001771	Yes
Thallium Dissolved	120	4.126	Sig	0.0001357	Yes
Thallium Total	120	3.622	Sig	0.0002502	Yes
Uranium Dissolved	120	0.3425	Not Sig	0.0006893	Yes
Uranium Total	120	0.6056	Not Sig	0.001196	Yes
Vanadium Dissolved	120	0.2119	Not Sig	-0.0005574	Yes
Vanadium Total	120	-0.8211	Not Sig	-0.004289	No
Zinc Dissolved	120	2.332	Sig	0.04183	Yes
Zinc Total	120	0.0346	Not Sig	0.0006188	Yes

	No Seasonality
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Table F3: Trending Summary for Cold River – Flow-Weighted Trend

Parameter	Z Critical = 1.960				Rank Von Neumann (alpha=0.05)
	n	Z Calc	p<0.05	Slope (units/yr)	
Nutrients					
Ammonia Dissolved	87	0.7259	Not Sig	0.00004462	Yes
Nitrate as N	87	3.966	Sig	0.0001705	Yes
Nitrogen Total	84	3.535	Sig	0.002073	Yes
Phosphorous Total	87	-1.398	Not Sig	-0.0001148	Yes
Phosphorous Total Dissolved	87	0.6783	Not Sig	0.00003204	No
Major Ions					
Chloride Dissolved	111	-7.076	Sig	-0.01399	Yes
Fluoride Dissolved	112	-1.597	Not Sig	-0.0003634	Yes
Sodium Dissolved/Filtered	112	0.5031	Not Sig	0.002631	No
Sulphate Dissolved	111	-4.264	Sig	-0.03794	Yes
Total Dissolved Solids (TDS)	104	-0.101	Not Sig	-0.002628	Yes
Physicals					
Oxygen Dissolved	109	3.65	Sig	0.0686	Yes
pH – Field	107	1.339	Not Sig	0.00566	Yes
Sodium Adsorption Ratio (SAR)	112	1.027	Not Sig	0.00002176	No
Total Suspended Solids (TSS)	87	-3.647	Sig	-0.03455	Yes
Metals					
Aluminum Dissolved	57	1.948	Not Sig	0.04995	No
Aluminum Total	57	-1.184	Not Sig	-0.07114	No
Arsenic Dissolved	57	-1.638	Not Sig	-0.003963	Yes
Arsenic Total	57	-3.084	Sig	-0.006648	No
Barium Dissolved	57	-0.02451	Not Sig	-0.001616	Yes
Barium Total	57	-1.459	Not Sig	-0.08872	No
Boron Dissolved	57	0.2754	Not Sig	0.02695	Yes
Boron Total	57	0.8261	Not Sig	0.05428	No
Cadmium Dissolved	57	6.147	Sig	0.002912	Yes
Cadmium Total	57	4.826	Sig	0.0009323	Yes
Chromium Dissolved	57	2.086	Sig	0.0007932	No
Chromium Total	57	0.8881	Not Sig	0.0004123	Yes
Cobalt Dissolved	57	3.003	Sig	0.0003678	Yes
Cobalt Total	57	-0.05507	Not Sig	-0.00000861	No
Copper Dissolved	57	4.068	Sig	0.01203	Yes
Copper Total	57	3.6	Sig	0.009026	No
Iron Dissolved	57	2.051	Sig	0.08783	Yes
Iron Total	57	-2.671	Sig	-0.3613	No
Lithium Dissolved	57	-1.989	Sig	-0.04482	Yes
Lithium Total	56	-1.611	Not Sig	-0.03624	Yes
Manganese Dissolved	56	3.541	Sig	0.03994	Yes
Manganese Total	56	-0.6714	Not Sig	-0.01274	No
Molybdenum Dissolved	57	-3.339	Sig	-0.004651	Yes
Molybdenum Total	57	-4.062	Sig	-0.005569	No
Nickel Dissolved	57	2.003	Sig	0.004566	Yes

Nickel Total	57	0.6196	Not Sig	0.001127	Yes
Uranium Dissolved	57	-0.3787	Not Sig	-0.00005565	Yes
Uranium Total	57	-2.251	Sig	-0.0004069	No
Vanadium Dissolved	57	-3.16	Sig	-0.001695	Yes
Vanadium Total	57	-3.649	Sig	-0.002127	Yes
Zinc Dissolved	57	1.852	Not Sig	0.01941	No

	No Seasonality
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Table F4: Trending Summary for North Saskatchewan River – Flow-Weighted Trend

Parameter	Z Critical = 1.960				Rank Von Neumann (alpha=0.05)
	n	Z Calc	p<0.05	Slope (units/yr)	
Nutrients					
Ammonia Dissolved	308	-1.533	Not Sig	-0.0002751	Yes
Nitrate as N	308	-4.094	Sig	-0.00475	Yes
Nitrogen Total	234	-4.289	Sig	-0.01598	Yes
Phosphorous Total	307	-6.284	Sig	-0.001796	Yes
Phosphorous Total Dissolved	295	-9.346	Sig	-0.001158	Yes
Major Ions					
Chloride Dissolved	251	3.618	Sig	0.03329	Yes
Fluoride Dissolved	250	-8.412	Sig	-0.001647	Yes
Sodium Dissolved/Filtered	250	0.2005	Not Sig	0.003335	Yes
Sulphate Dissolved	251	4.336	Sig	0.1862	Yes
Total Dissolved Solids (TDS)	247	3.889	Sig	0.5412	Yes
Physicals					
Oxygen Dissolved	303	2.583	Sig	0.03491	Yes
pH – Field	293	0.5225	Not Sig	0.001566	Yes
Sodium Adsorption Ratio (SAR)	250	-0.4487	Not Sig	-0.0002355	Yes
Total Suspended Solids (TSS)	308	-1.403	Not Sig	-0.1117	Yes
Metals					
Aluminum Dissolved	128	-3.675	Sig	-1.34	Yes
Aluminum Total	128	-1.883	Not Sig	-6.948	Yes
Arsenic Dissolved	128	-4.004	Sig	-0.01029	Yes
Arsenic Total	128	-2.379	Sig	-0.01407	Yes
Barium Dissolved	128	-1.53	Not Sig	-0.3337	Yes
Barium Total	128	-0.6583	Not Sig	-0.1999	Yes
Beryllium Dissolved	128	4.847	Sig	0.0001455	Yes
Beryllium Total	128	1.071	Not Sig	0.0003113	Yes
Boron Dissolved	128	-2.577	Sig	-0.2059	Yes
Boron Total	128	-0.4367	Not Sig	-0.04378	Yes
Cadmium Dissolved	128	8.173	Sig	0.00354	Yes
Cadmium Total	128	2.758	Sig	0.001596	Yes
Chromium Dissolved	128	2.637	Sig	0.001349	No
Chromium Total	128	-0.3291	Not Sig	-0.003448	Yes
Cobalt Dissolved	128	-2.821	Sig	-0.002474	Yes
Cobalt Total	128	-1.219	Not Sig	-0.005204	Yes
Copper Dissolved	128	-0.2266	Not Sig	-0.0009606	No
Copper Total	128	-1.221	Not Sig	-0.02066	Yes
Iron Dissolved	128	-1.367	Not Sig	-0.3416	Yes
Iron Total	128	-0.7765	Not Sig	-6.052	Yes
Lead Dissolved	128	-2.206	Sig	-0.001151	Yes
Lead Total	128	-0.7971	Not Sig	-0.005342	Yes
Lithium Dissolved	128	-3.648	Sig	-0.09205	Yes
Lithium Total	128	-1.697	Not Sig	-0.066	Yes

Manganese Dissolved	128	-1.971	Sig	-0.09597	Yes
Manganese Total	128	-1.355	Not Sig	-0.4791	Yes
Molybdenum Dissolved	128	-3.123	Sig	-0.01688	Yes
Molybdenum Total	128	-2.548	Sig	-0.01229	Yes
Nickel Dissolved	128	-1.252	Not Sig	-0.008864	Yes
Nickel Total	128	-0.8754	Not Sig	-0.01977	Yes
Selenium Dissolved	128	-5.024	Sig	-0.01357	Yes
Selenium Total	128	-3.732	Sig	-0.0128	Yes
Silver Total	128	-1.827	Not Sig	-0.000245	Yes
Thallium Dissolved	128	3.99	Sig	0.0002532	Yes
Thallium Total	128	1.195	Not Sig	0.0001958	Yes
Uranium Dissolved	128	-0.5273	Not Sig	-0.001236	Yes
Uranium Total	128	0.7758	Not Sig	0.001943	Yes
Vanadium Dissolved	128	-4.906	Sig	-0.01152	Yes
Vanadium Total	128	-2.264	Sig	-0.02718	Yes
Zinc Dissolved	128	2.805	Sig	0.04444	Yes
Zinc Total	128	-0.6935	Not Sig	-0.03758	Yes

	No Seasonality
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Table F5: Trending Summary for Red Deer River near Bindloss – Flow-Weighted Trend

Parameter	Z Critical = 1.960				Rank Von Neumann (alpha=0.05)
	n	Z Calc	p<0.05	Slope (units/yr)	
Nutrients					
Ammonia Dissolved	400	-3.705	Sig	-0.0003711	Yes
Nitrate as N	565	-2.163	Sig	-0.00001688	Yes
Nitrogen Total	230	3.942	Sig	0.01347	Yes
Phosphorous Total	493	-1.47	Not Sig	-0.000215	Yes
Phosphorous Total Dissolved	462	-2.592	Sig	-0.00006245	Yes
Major Ions					
Chloride Dissolved	515	14.49	Sig	0.1049	Yes
Fluoride Dissolved	458	0.4174	Not Sig	0.00004079	Yes
Sodium Dissolved/Filtered	517	3.294	Sig	0.1008	Yes
Sulphate Dissolved	516	1.93	Not Sig	0.1037	Yes
Total Dissolved Solids (TDS)	323	6.569	Sig	1.665	Yes
Physicals					
Oxygen Dissolved	471	-1.014	Not Sig	-0.008781	Yes
pH – Field	483	5.041	Sig	0.006168	Yes
Sodium Adsorption Ratio (SAR)	414	3.062	Sig	0.003781	Yes
Total Suspended Solids (TSS)	511	-1.41	Not Sig	-0.1838	Yes
Metals					
Aluminum Dissolved	128	3.275	Sig	0.2273	Yes
Aluminum Total	128	-1.928	Not Sig	-27.32	No
Arsenic Dissolved	128	1.392	Not Sig	0.006465	Yes
Arsenic Total	128	0.2183	Not Sig	0.003532	
Barium Dissolved	128	-0.1049	Not Sig	-0.04746	Yes
Barium Total	128	-0.9522	Not Sig	-1.115	Yes
Beryllium Dissolved	128	5.543	Sig	0.0001603	Yes
Beryllium Total	128	-0.7696	Not Sig	-0.0009163	No
Boron Dissolved	128	2.332	Sig	0.3707	Yes
Boron Total	128	2.793	Sig	0.4827	Yes
Cadmium Dissolved	128	6.26	Sig	0.002653	Yes
Cadmium Total	128	1.081	Not Sig	0.001189	Yes
Chromium Dissolved	128	2.966	Sig	0.002558	Yes
Chromium Total	128	-1.121	Not Sig	-0.01958	No
Cobalt Dissolved	128	-0.3687	Not Sig	-0.0004871	No
Cobalt Total	128	-1.12	Not Sig	-0.01589	No
Copper Dissolved	128	0.6076	Not Sig	0.006948	No
Copper Total	128	-0.9063	Not Sig	-0.04129	No
Iron Dissolved	128	2.169	Sig	0.3074	Yes
Iron Total	128	-1.461	Not Sig	-29.56	No
Lead Dissolved	128	0.2099	Not Sig	0.0001792	Yes
Lead Total	128	-0.4531	Not Sig	-0.00752	No
Lithium Dissolved	128	1.955	Not Sig	0.2008	Yes
Lithium Total	128	1.248	Not Sig	0.1726	No

Manganese Dissolved	128	-0.2565	Not Sig	-0.01462	Yes
Manganese Total	128	-1.838	Not Sig	-1.758	Yes
Molybdenum Dissolved	128	-2.569	Sig	-0.02219	Yes
Molybdenum Total	128	-1.115	Not Sig	-0.01001	Yes
Nickel Dissolved	128	0.3872	Not Sig	0.004412	No
Nickel Total	128	-0.8218	Not Sig	-0.04392	No
Selenium Dissolved	128	1.943	Not Sig	0.005087	Yes
Selenium Total	128	2.227	Sig	0.006656	Yes
Silver Total	128	-0.7085	Not Sig	-0.0002088	Yes
Thallium Dissolved	128	1.852	Not Sig	0.0001926	Yes
Thallium Total	128	0.06797	Not Sig	0.00003827	Yes
Uranium Dissolved	128	2.859	Sig	0.02416	Yes
Uranium Total	128	2.013	Sig	0.02507	Yes
Vanadium Dissolved	128	-1.706	Not Sig	-0.008084	Yes
Vanadium Total	128	-1.792	Not Sig	-0.07386	No
Zinc Dissolved	128	1.71	Not Sig	0.02732	Yes
Zinc Total	128	-0.482	Not Sig	-0.05623	No

	No Seasonality
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Table F6: Trending Summary for South Saskatchewan River – Flow-Weighted Trend

Parameter	Z Critical = 1.960				Rank Von Neumann (alpha=0.05)
	n	Z Calc	p<0.05	Slope (units/yr)	
Nutrients					
Ammonia Dissolved	371	-6.243	Sig	-0.0007969	Yes
Nitrate as N	588	1.797	Not Sig	0.00009782	Yes
Nitrogen Total	377	4.166	Sig	0.007188	Yes
Phosphorous Total	566	-7.487	Sig	-0.0009238	Yes
Phosphorous Total Dissolved	525	-10.01	Sig	-0.0002432	Yes
Major Ions					
Chloride Dissolved	460	17.13	Sig	0.1494	Yes
Fluoride Dissolved	449	5.84	Sig	0.0005886	Yes
Sodium Dissolved/Filtered	464	9.629	Sig	0.1721	Yes
Sulphate Dissolved	460	8.611	Sig	0.3964	Yes
Total Dissolved Solids (TDS)	319	9.613	Sig	1.836	Yes
Physicals					
Oxygen Dissolved	470	1.173	Not Sig	0.008557	Yes
pH – Field	476	5.659	Sig	0.006971	Yes
Sodium Adsorption Ratio (SAR)	411	7.753	Sig	0.005041	Yes
Total Suspended Solids (TSS)	559	-2.042	Sig	-0.1545	Yes
Metals					
Aluminum Dissolved	128	1.741	Not Sig	0.1967	Yes
Aluminum Total	128	-3.473	Sig	-16.16	No
Arsenic Dissolved	128	-2.052	Sig	-0.008055	Yes
Arsenic Total	128	-2.67	Sig	-0.02041	Yes
Barium Dissolved	128	0.6323	Not Sig	0.1575	Yes
Barium Total	128	-1.16	Not Sig	-0.6192	Yes
Beryllium Total	128	-0.8317	Not Sig	-0.0002886	Yes
Boron Dissolved	128	-0.3342	Not Sig	-0.04293	Yes
Boron Total	128	-0.9716	Not Sig	-0.1001	Yes
Cadmium Dissolved	128	6.15	Sig	0.002108	Yes
Cadmium Total	128	1.66	Not Sig	0.0007676	Yes
Chromium Dissolved	128	4.924	Sig	0.003711	Yes
Chromium Total	128	-1.761	Not Sig	-0.01166	Yes
Cobalt Dissolved	128	-1.803	Not Sig	-0.001659	Yes
Cobalt Total	128	-2.728	Sig	-0.01417	Yes
Copper Dissolved	128	1.182	Not Sig	0.00973	Yes
Copper Total	128	-1.784	Not Sig	-0.03479	Yes
Iron Dissolved	128	1.998	Sig	0.2663	Yes
Iron Total	128	-2.635	Sig	-18.26	Yes
Lead Dissolved	128	0.01555	Not Sig	0.000008782	Yes
Lead Total	128	-2.433	Sig	-0.01682	Yes
Lithium Dissolved	128	0.2332	Not Sig	0.01482	Yes
Lithium Total	128	0	Not Sig	-0.0006282	Yes
Manganese Dissolved	128	1.349	Not Sig	0.03101	Yes

Manganese Total	128	-2.456	Sig	-0.7014	Yes
Molybdenum Dissolved	128	-3.846	Sig	-0.02481	Yes
Molybdenum Total	128	-3.378	Sig	-0.01848	Yes
Nickel Dissolved	128	0.6607	Not Sig	0.004575	Yes
Nickel Total	128	-2.386	Sig	-0.0505	Yes
Selenium Dissolved	128	2.379	Sig	0.008513	Yes
Selenium Total	128	2.258	Sig	0.009157	Yes
Silver Total	128	-1.042	Not Sig	-0.0001423	Yes
Thallium Dissolved	128	3.913	Sig	0.000341	Yes
Thallium Total	128	0.1895	Not Sig	0.00002902	Yes
Uranium Dissolved	128	1.885	Not Sig	0.0104	Yes
Uranium Total	128	1.162	Not Sig	0.008262	Yes
Vanadium Dissolved	128	-2.705	Sig	-0.006386	Yes
Vanadium Total	128	-3.261	Sig	-0.04449	Yes
Zinc Dissolved	128	2.651	Sig	0.0415	Yes
Zinc Total	128	-1.232	Not Sig	-0.06077	Yes

	No Seasonality
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Table F7: Trending Summary for Assiniboine River – Flow-Weighted Trend

Parameter	Z Critical = 1.960				Rank Von Neumann (alpha=0.05)
	n	Z Calc	p<0.05	Slope (units/yr)	
Nutrients					
Ammonia Dissolved	331	2.336	Sig	0.0004494	Yes
Nitrate as N	523	-1.828	Not Sig	-0.0001116	Yes
Nitrogen Total	228	5.69	Sig	0.02982	Yes
Phosphorous Total	510	0.757	Not Sig	0.0001523	Yes
Phosphorous Total Dissolved	472	-1.27	Not Sig	-0.0001669	Yes
Major Ions					
Chloride Dissolved	504	7.456	Sig	0.2438	Yes
Fluoride Dissolved	492	4.242	Sig	0.0005971	Yes
Sodium Dissolved/Filtered	506	7.744	Sig	0.4113	Yes
Sulphate Dissolved	494	5.937	Sig	1.481	Yes
Total Dissolved Solids (TDS)	376	7.3	Sig	5.282	Yes
Physicals					
Oxygen Dissolved	466	-2.703	Sig	-0.0269	Yes
pH – Field	490	2.207	Sig	0.002501	Yes
Sodium Adsorption Ratio (SAR)	455	3.234	Sig	0.003429	Yes
Total Suspended Solids (TSS)	487	3.577	Sig	0.1125	Yes
Metals					
Aluminum Dissolved	127	-2.901	Sig	-0.1401	Yes
Aluminum Total	127	-0.8088	Not Sig	-2.231	Yes
Arsenic Dissolved	127	-1.338	Not Sig	-0.03405	Yes
Arsenic Total	127	-1.811	Not Sig	-0.05311	Yes
Barium Dissolved	127	3.939	Sig	0.9722	Yes
Barium Total	127	1.867	Not Sig	0.5656	Yes
Beryllium Dissolved	127	6.956	Sig	0.0003994	Yes
Beryllium Total	127	2.391	Sig	0.0006185	Yes
Boron Dissolved	127	1.29	Not Sig	0.5726	Yes
Boron Total	127	-1.038	Not Sig	-0.3913	Yes
Cadmium Dissolved	127	-2.586	Sig	-0.001047	Yes
Cadmium Total	127	-1.235	Not Sig	-0.000442	Yes
Chromium Dissolved	127	1.609	Not Sig	0.002086	Yes
Chromium Total	127	-0.7063	Not Sig	-0.004024	Yes
Cobalt Dissolved	127	1.547	Not Sig	0.003558	Yes
Cobalt Total	127	0.3078	Not Sig	0.001835	Yes
Copper Dissolved	127	2.079	Sig	0.0194	Yes
Copper Total	127	0.5366	Not Sig	0.008613	Yes
Iron Dissolved	127	0.4971	Not Sig	0.2358	Yes
Iron Total	127	1.44	Not Sig	14.04	Yes
Lead Dissolved	127	-2.088	Sig	-0.001416	Yes
Lead Total	127	0.2407	Not Sig	0.00148	Yes
Lithium Dissolved	127	3.595	Sig	1.466	Yes
Lithium Total	127	2.478	Sig	1.041	Yes
Manganese Dissolved	127	2.127	Sig	4.029	Yes

Manganese Total	127	2.044	Sig	5.686	Yes
Molybdenum Dissolved	127	-1.661	Not Sig	-0.02746	Yes
Molybdenum Total	127	-2.604	Sig	-0.04401	Yes
Nickel Dissolved	127	-0.5287	Not Sig	-0.006264	Yes
Nickel Total	127	-0.509	Not Sig	-0.01134	Yes
Selenium Dissolved	127	3.255	Sig	0.01005	Yes
Selenium Total	127	3.429	Sig	0.0125	Yes
Silver Total	127	0.01973	Not Sig	0.000002847	Yes
Thallium Dissolved	127	5.527	Sig	0.000711	Yes
Thallium Total	127	3.879	Sig	0.0007274	Yes
Uranium Dissolved	127	5.566	Sig	0.2056	Yes
Uranium Total	127	4.86	Sig	0.1721	Yes
Vanadium Dissolved	127	-0.07497	Not Sig	-0.0007082	Yes
Vanadium Total	127	-0.7181	Not Sig	-0.01207	Yes
Zinc Dissolved	127	-2.182	Sig	-0.04089	Yes
Zinc Total	127	0.7141	Not Sig	0.02796	Yes

	No Seasonality
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Table F8: Trending Summary for Carrot River – Flow-Weighted Trend

Parameter	Z Critical = 1.960				Rank Von Neumann (alpha=0.05)
	n	Z Calc	p<0.05	Slope (units/yr)	
Nutrients					
Ammonia Dissolved	360	3.548	Sig	0.001004	Yes
Nitrate as N	446	-0.6532	Not Sig	-0.00002501	Yes
Nitrogen Total	220	5.579	Sig	0.02373	Yes
Phosphorous Total	439	8	Sig	0.001196	Yes
Phosphorous Total Dissolved	421	7.988	Sig	0.0003796	Yes
Major Ions					
Chloride Dissolved	391	-7.104	Sig	-1.434	Yes
Fluoride Dissolved	393	4.363	Sig	0.000604	Yes
Sodium Dissolved/Filtered	393	-6.22	Sig	-0.7004	Yes
Sulphate Dissolved	395	2.586	Sig	0.2861	Yes
Total Dissolved Solids (TDS)	302	0.7874	Not Sig	0.5086	Yes
Physicals					
Oxygen Dissolved	425	-3.823	Sig	-0.05125	Yes
pH – Field	441	2.605	Sig	0.003272	Yes
Sodium Adsorption Ratio (SAR)	380	-6.656	Sig	-0.01465	Yes
Total Suspended Solids (TSS)	442	2.474	Sig	0.1201	Yes
Metals					
Aluminum Dissolved	107	-1.584	Not Sig	-0.1323	Yes
Aluminum Total	107	-1.589	Not Sig	-6.245	Yes
Arsenic Dissolved	107	-0.2907	Not Sig	-0.005155	Yes
Arsenic Total	107	-0.428	Not Sig	-0.01259	Yes
Barium Dissolved	107	3.855	Sig	2.043	Yes
Barium Total	107	2.497	Sig	1.666	Yes
Beryllium Dissolved	107	6.313	Sig	0.0005356	Yes
Beryllium Total	107	1.002	Not Sig	0.0002659	Yes
Boron Dissolved	107	2.527	Sig	1.939	Yes
Boron Total	107	1.94	Not Sig	1.42	Yes
Cadmium Dissolved	107	-2.754	Sig	-0.0013	Yes
Cadmium Total	107	-2.734	Sig	-0.001238	Yes
Chromium Dissolved	107	-1.15	Not Sig	-0.00916	Yes
Chromium Total	107	-3.753	Sig	-0.00346	Yes
Cobalt Dissolved	107	0.7453	Not Sig	0.003374	No
Cobalt Total	107	-0.03948	Not Sig	-0.0004845	Yes
Copper Dissolved	107	1.288	Not Sig	0.01459	Yes
Copper Total	107	0.2567	Not Sig	0.004156	No
Iron Dissolved	107	-2.838	Sig	-7.695	Yes
Iron Total	107	-0.09378	Not Sig	-1.038	Yes
Lead Dissolved	107	-2.315	Sig	-0.00257	Yes
Lead Total	107	-0.9279	Not Sig	-0.005371	Yes
Lithium Dissolved	107	2.853	Sig	1.046	Yes
Lithium Total	107	2.31	Sig	0.7894	Yes
Manganese Dissolved	107	0.7848	Not Sig	1.96	No

Manganese Total	107	0.6367	Not Sig	2.582	No
Molybdenum Dissolved	107	-0.9234	Not Sig	-0.01591	Yes
Molybdenum Total	107	-1.228	Not Sig	-0.02242	Yes
Nickel Dissolved	107	-0.4146	Not Sig	-0.006042	Yes
Nickel Total	107	-0.6663	Not Sig	-0.01502	Yes
Selenium Dissolved	107	-0.2611	Not Sig	-0.0005536	Yes
Selenium Total	107	-0.3716	Not Sig	-0.0001227	No
Silver Total	107	-0.7897	Not Sig	-0.00005284	No
Thallium Dissolved	107	3.448	Sig	0.0006633	Yes
Thallium Total	107	0.9378	Not Sig	0.0002819	Yes
Uranium Dissolved	107	4.985	Sig	0.09048	Yes
Uranium Total	107	4.294	Sig	0.0789	Yes
Vanadium Dissolved	107	-0.8539	Not Sig	-0.007478	Yes
Vanadium Total	107	-1.52	Not Sig	-0.03052	Yes
Zinc Dissolved	107	-1.841	Not Sig	-0.03936	Yes
Zinc Total	107	-0.8242	Not Sig	-0.03303	Yes

	No Seasonality
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Table F9: Trending Summary for Churchill River – Flow-Weighted Trend

Parameter	Z Critical = 1.960				Rank Von Neumann (alpha=0.05)
	n	Z Calc	p<0.05	Slope (units/yr)	
Nutrients					
Ammonia Dissolved	167	-8.142	Sig	-0.001157	Yes
Nitrate as N	239	-2.142	Sig	-0.00001983	Yes
Nitrogen Total	78	-0.5252	Not Sig	-0.0007428	No
Phosphorous Total	238	0.4106	Not Sig	0.000004534	Yes
Phosphorous Total Dissolved	220	1.772	Not Sig	0.00000084	No
Major Ions					
Chloride Dissolved	240	0.8544	Not Sig	0.001573	Yes
Fluoride Dissolved	240	3.087	Sig	0.0003185	Yes
Sodium Dissolved/Filtered	240	1.43	Not Sig	0.006463	Yes
Sulphate Dissolved	240	-1.509	Not Sig	-0.005096	Yes
Total Dissolved Solids (TDS)	175	0.4086	Not Sig	0.06796	Yes
Physicals					
Oxygen Dissolved	227	-1.402	Not Sig	-0.0148	Yes
pH – Field	232	4.91	Sig	0.01356	Yes
Sodium Adsorption Ratio (SAR)	231	4.321	Sig	0.000759	Yes
Total Suspended Solids (TSS)	234	1.907	Not Sig	0.0107	No
Metals					
Aluminum Dissolved	37	-1.118	Not Sig	-0.7161	No
Aluminum Total	37	-4.138	Sig	-12.6	Yes
Arsenic Dissolved	37	34	Not Sig	0.001382	No
Arsenic Total	37	-44	Not Sig	-0.002114	No
Barium Dissolved	37	86	Not Sig	0.1848	No
Barium Total	37	14	Not Sig	0.03887	No
Beryllium Dissolved	37	198	Sig	0.0001762	Yes
Beryllium Total	37	-2.498	Sig	-0.0003726	No
Boron Dissolved	37	108	Not Sig	0.1985	No
Boron Total	37	91	Not Sig	0.1956	Yes
Cadmium Dissolved	37	-124	Not Sig	-0.0006938	No
Cadmium Total	37	-124	Not Sig	-0.0002343	Yes
Chromium Dissolved	37	52	Not Sig	0.001269	No
Chromium Total	37	-350	Sig	-0.02876	Yes
Cobalt Dissolved	37	0	Not Sig	-0.000005389	No
Cobalt Total	37	-3.654	Sig	-0.005698	Yes
Copper Dissolved	37	80	Not Sig	0.008366	No
Copper Total	37	-0.07457	Not Sig	-0.0008627	Yes
Iron Dissolved	37	-106	Not Sig	-0.9031	No
Iron Total	37	-4.399	Sig	-15.77	Yes
Lead Dissolved	37	-86	Not Sig	-0.0007212	No
Lead Total	37	-297	Sig	-0.005314	Yes
Lithium Dissolved	37	66	Not Sig	0.02822	No
Lithium Total	37	24	Not Sig	0.009461	No
Manganese Dissolved	37	-3.169	Sig	-0.06536	No

Manganese Total	37	-2.274	Sig	-0.8991	No
Molybdenum Dissolved	37	96	Not Sig	0.002762	No
Molybdenum Total	37	89	Not Sig	0.002068	No
Nickel Dissolved	37	-1.715	Not Sig	-0.00544	No
Nickel Total	37	-3.467	Sig	-0.01802	Yes
Thallium Dissolved	37	24	Not Sig	0.00002592	No
Thallium Total	37	-1.678	Not Sig	-0.000211	No
Uranium Dissolved	37	146	Not Sig	0.003478	No
Uranium Total	37	-0.9321	Not Sig	-0.0007344	No
Vanadium Dissolved	37	-1.846	Not Sig	-0.006741	No
Vanadium Total	37	-3.654	Sig	-0.0252	Yes
Zinc Dissolved	37	-1.752	Not Sig	-0.02342	No
Zinc Total	37	-208	Sig	-0.0398	Yes

	No Seasonality
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Table F10: Trending Summary for Qu'Appelle River – Flow-Weighted Trend

Parameter	Z Critical = 1.960				Rank Von Neumann (alpha=0.05)
	n	Z Calc	p<0.05	Slope (units/yr)	
Nutrients					
Ammonia Dissolved	364	-0.6767	Not Sig	-0.00007841	Yes
Nitrate as N	429	0.6375	Not Sig	0.00002618	Yes
Nitrogen Total	208	3.72	Sig	0.01352	Yes
Phosphorous Total	428	-2.163	Sig	-0.0007623	Yes
Phosphorous Total Dissolved	428	-1.69	Not Sig	-0.0004609	Yes
Major Ions					
Chloride Dissolved	389	-1.928	Not Sig	-0.1325	Yes
Fluoride Dissolved	392	-3.23	Sig	-0.0004727	Yes
Sodium Dissolved/Filtered	389	-3.563	Sig	-0.5242	Yes
Sulphate Dissolved	391	3.255	Sig	0.9539	Yes
Total Dissolved Solids (TDS)	323	0.8108	Not Sig	0.5227	Yes
Physicals					
Oxygen Dissolved	419	-1.87	Not Sig	-0.01822	Yes
pH – Field	423	0.839	Not Sig	0.0007983	Yes
Sodium Adsorption Ratio (SAR)	367	-5.284	Sig	-0.0172	Yes
Total Suspended Solids (TSS)	431	1.377	Not Sig	0.1051	Yes
Metals					
Aluminum Dissolved	106	-0.4313	Not Sig	-0.02365	Yes
Aluminum Total	106	-4.541	Sig	-31.52	Yes
Arsenic Dissolved	106	3.918	Sig	0.2921	Yes
Arsenic Total	106	2.259	Sig	0.1511	Yes
Barium Dissolved	106	3.229	Sig	0.7633	Yes
Barium Total	106	-2.569	Sig	-1.058	Yes
Beryllium Dissolved	106	7.499	Sig	0.0009519	Yes
Beryllium Total	106	-0.8965	Not Sig	-0.0005692	Yes
Boron Dissolved	106	-1.742	Not Sig	-3.086	Yes
Boron Total	106	-2.776	Sig	-4.483	Yes
Cadmium Dissolved	106	-3.991	Sig	-0.002238	Yes
Cadmium Total	106	-4.335	Sig	-0.001997	Yes
Chromium Dissolved	106	1.07	Not Sig	0.001152	Yes
Chromium Total	106	-3.203	Sig	-0.03234	Yes
Cobalt Dissolved	106	5.211	Sig	0.01605	Yes
Cobalt Total	106	-1.536	Not Sig	-0.01581	Yes
Copper Dissolved	106	2.883	Sig	0.02999	Yes
Copper Total	106	-1.274	Not Sig	-0.04302	Yes
Iron Dissolved	106	1.636	Not Sig	0.2454	Yes
Iron Total	106	-2.621	Sig	-37.58	Yes
Lead Dissolved	106	0.8299	Not Sig	0.0005823	Yes
Lead Total	106	-2.91	Sig	-0.02594	Yes
Lithium Dissolved	106	1.291	Not Sig	0.491	Yes
Lithium Total	106	-0.8409	Not Sig	-0.3122	No
Manganese Dissolved	106	4.472	Sig	7.43	Yes

Manganese Total	106	0.3722	Not Sig	1.059	Yes
Molybdenum Dissolved	106	-1.594	Not Sig	-0.03978	Yes
Molybdenum Total	106	-2.359	Sig	-0.05926	Yes
Nickel Dissolved	106	4.51	Sig	0.07757	Yes
Nickel Total	106	-1.4	Not Sig	-0.05568	Yes
Selenium Dissolved	106	6.243	Sig	0.03536	Yes
Selenium Total	106	5.304	Sig	0.02776	Yes
Silver Total	106	-1.258	Not Sig	-0.0001846	Yes
Thallium Dissolved	106	3.041	Sig	0.0004905	Yes
Thallium Total	106	-0.6553	Not Sig	-0.0001831	Yes
Uranium Dissolved	106	5.558	Sig	0.1442	Yes
Uranium Total	106	4.15	Sig	0.109	Yes
Vanadium Dissolved	106	3.465	Sig	0.1033	Yes
Vanadium Total	106	-0.7444	Not Sig	-0.03996	Yes
Zinc Dissolved	106	-2.343	Sig	-0.04507	Yes
Zinc Total	106	-2.878	Sig	-0.2	Yes

	No Seasonality
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Table F11: Trending Summary for Red Deer River at Erwood – Flow-Weighted Trend

Parameter	Z Critical = 1.960				Rank Von Neumann (alpha=0.05)
	n	Z Calc	p<0.05	Slope (units/yr)	
Nutrients					
Ammonia Dissolved	265	-3.492	Sig	-0.000502	Yes
Nitrate as N	394	-2.966	Sig	-0.00004719	Yes
Nitrogen Total	127	2.945	Sig	0.01254	Yes
Phosphorous Total	352	4.012	Sig	0.0003343	Yes
Phosphorous Total Dissolved	312	3.353	Sig	0.0001543	Yes
Major Ions					
Chloride Dissolved	400	5.205	Sig	0.03564	Yes
Fluoride Dissolved	372	4.744	Sig	0.0006342	Yes
Sodium Dissolved/Filtered	400	5.243	Sig	0.09598	Yes
Sulphate Dissolved	400	1.758	Not Sig	0.2446	Yes
Total Dissolved Solids (TDS)	261	8.14	Sig	4.472	Yes
Physicals					
Oxygen Dissolved	340	-0.5345	Not Sig	-0.005715	Yes
pH – Field	351	2.353	Sig	0.004138	Yes
Sodium Adsorption Ratio (SAR)	330	4.677	Sig	0.001938	Yes
Total Suspended Solids (TSS)	353	0.8608	Not Sig	0.0155	Yes
Metals					
Aluminum Dissolved	69	1.321	Not Sig	0.1108	Yes
Aluminum Total	69	0.01034	Not Sig	0.03741	No
Arsenic Dissolved	69	0.4447	Not Sig	0.003778	No
Arsenic Total	69	0.09841	Not Sig	0.001635	No
Barium Dissolved	69	1.238	Not Sig	0.4948	Yes
Barium Total	69	0.362	Not Sig	0.2021	No
Beryllium Dissolved	69	3.258	Sig	0.00027	No
Beryllium Total	69	1.458	Not Sig	0.0004353	No
Boron Dissolved	69	2.605	Sig	1.078	Yes
Boron Total	69	1.238	Not Sig	0.4033	Yes
Cadmium Dissolved	69	-1.378	Not Sig	-0.0007281	Yes
Cadmium Total	69	-0.07239	Not Sig	-0.00005624	No
Chromium Dissolved	69	-1.344	Not Sig	-0.001629	Yes
Chromium Total	69	0.5067	Not Sig	0.003158	No
Cobalt Dissolved	69	-0.1709	Not Sig	-0.0004211	Yes
Cobalt Total	69	0.2171	Not Sig	0.001278	No
Copper Dissolved	69	1.756	Not Sig	0.01947	Yes
Copper Total	69	0.4861	Not Sig	0.01057	No
Iron Dissolved	69	-2.554	Sig	-4.06	No
Iron Total	69	-0.7756	Not Sig	-6.241	No
Lead Dissolved	69	-3.988	Sig	-0.003635	Yes
Lead Total	69	-0.2585	Not Sig	-0.0009898	No
Lithium Dissolved	69	1.818	Not Sig	0.5777	Yes
Lithium Total	69	0.9375	Not Sig	0.2775	Yes

Manganese Dissolved	69	-0.7343	Not Sig	-0.2629	Yes
Manganese Total	69	-0.9375	Not Sig	-1.478	Yes
Molybdenum Dissolved	69	0.4817	Not Sig	0.007709	Yes
Molybdenum Total	69	-0.1968	Not Sig	-0.005111	Yes
Nickel Dissolved	69	-1.958	Not Sig	-0.03596	Yes
Nickel Total	69	-1.003	Not Sig	-0.04197	No
Selenium Dissolved	69	2.864	Sig	0.009498	Yes
Selenium Total	69	2.357	Sig	0.009993	Yes
Silver Dissolved					CD
Silver Total	69	0.7136	Not Sig	0.00006393	No
Thallium Dissolved	69	1.507	Not Sig	0.0002283	Yes
Thallium Total	69	1.024	Not Sig	0.0003207	No
Uranium Dissolved	69	3.833	Sig	0.09747	Yes
Uranium Total	69	3.009	Sig	0.08287	Yes
Vanadium Dissolved	69	-0.1758	Not Sig	-0.0009207	No
Vanadium Total	69	-0.4247	Not Sig	-0.006752	No
Zinc Dissolved	69	-0.3826	Not Sig	-0.008066	No
Zinc Total	69	0.1344	Not Sig	0.004141	Yes

	No Seasonality
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Table F12: Trending Summary for Saskatchewan River – Flow-Weighted Trend

Parameter	Z Critical = 1.960				Rank Von Neumann (alpha=0.05)
	n	Z Calc	p<0.05	Slope (units/yr)	
Nutrients					
Ammonia Dissolved	332	-5.389	Sig	-0.0005127	Yes
Nitrate as N	413	-3.022	Sig	-0.000307	Yes
Nitrogen Total	199	0.2875	Not Sig	0.0004969	Yes
Phosphorous Total	413	-5.485	Sig	-0.0003619	Yes
Phosphorous Total Dissolved	394	-4.05	Sig	-0.00006268	Yes
Major Ions					
Chloride Dissolved	413	8.29	Sig	0.05844	Yes
Fluoride Dissolved	413	2.542	Sig	0.0002488	Yes
Sodium Dissolved/Filtered	413	5.146	Sig	0.06351	Yes
Sulphate Dissolved	413	7.307	Sig	0.2841	Yes
Total Dissolved Solids (TDS)	322	6.614	Sig	0.9035	Yes
Physicals					
Oxygen Dissolved	398	-1.35	Not Sig	-0.01162	Yes
pH – Field	403	5.22	Sig	0.00691	Yes
Sodium Adsorption Ratio (SAR)	402	4.8	Sig	0.001722	Yes
Total Suspended Solids (TSS)	412	-1.736	Not Sig	-0.0923	Yes
Metals					
Aluminum Dissolved	109	0.1974	Not Sig	0.01582	No
Aluminum Total	109	-4.291	Sig	-32.09	Yes
Arsenic Dissolved	109	0.2632	Not Sig	0.001559	Yes
Arsenic Total	109	-2.669	Sig	-0.03031	Yes
Barium Dissolved	109	1.847	Not Sig	0.4933	Yes
Barium Total	109	-2.797	Sig	-0.9707	Yes
Beryllium Dissolved	109	5.811	Sig	0.0001781	No
Beryllium Total	109	-2.956	Sig	-0.001635	Yes
Boron Dissolved	109	4.103	Sig	0.5648	Yes
Boron Total	109	2.406	Sig	0.2791	Yes
Cadmium Dissolved	109	-1.186	Not Sig	-0.0003103	Yes
Cadmium Total	109	-4.869	Sig	-0.001687	Yes
Chromium Dissolved	109	-0.1081	Not Sig	-0.00005673	No
Chromium Total	109	-3.736	Sig	-0.05885	Yes
Cobalt Dissolved	109	0.0329	Not Sig	0.0000252	Yes
Cobalt Total	109	-4.211	Sig	-0.02623	Yes
Copper Dissolved	109	3.149	Sig	0.02294	Yes
Copper Total	109	-2.383	Sig	-0.04934	Yes
Iron Dissolved	109	0.5451	Not Sig	0.1475	Yes
Iron Total	109	-3.529	Sig	-50	Yes
Lead Dissolved	109	-1.037	Not Sig	-0.0004176	Yes
Lead Total	109	-4.53	Sig	-0.03395	Yes
Lithium Dissolved	109	5.719	Sig	0.3666	Yes
Lithium Total	109	4.009	Sig	0.2406	Yes
Manganese Dissolved	109	2.336	Sig	0.07322	Yes

Manganese Total	109	-2.359	Sig	-1.416	Yes
Molybdenum Dissolved	109	-0.9258	Not Sig	-0.005079	Yes
Molybdenum Total	109	-1.396	Not Sig	-0.009435	Yes
Nickel Dissolved	109	-0.1786	Not Sig	-0.001013	Yes
Nickel Total	109	-4.417	Sig	-0.08975	Yes
Selenium Dissolved	109	4.901	Sig	0.009326	Yes
Selenium Total	109	3.341	Sig	0.007408	Yes
Silver Total	109	-2.862	Sig	-0.0004809	No
Thallium Dissolved	109	2.603	Sig	0.0002063	Yes
Thallium Total	109	-2.411	Sig	-0.0005685	No
Uranium Dissolved	109	5.639	Sig	0.02757	Yes
Uranium Total	109	4.507	Sig	0.01976	Yes
Vanadium Dissolved	109	-0.6626	Not Sig	-0.002705	Yes
Vanadium Total	109	-4.131	Sig	-0.09122	Yes
Zinc Dissolved	109	0.06109	Not Sig	0.0004247	Yes
Zinc Total	109	-3.604	Sig	-0.207	Yes

	No Seasonality
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Appendix G: Magnitude of Trend Tables

Table G1: Trend Magnitude Table for Non-Metals on Alberta/Saskatchewan Border – Flow-Weighted Trend

	Battle River			Beaver River			Cold River			North Saskatchewan River			Red Deer River at Bindloss			South Saskatchewan River		
	Rate Δ (Units/yr)	5 yr % Change	10 yr % Change	Rate Δ (Units/yr)	5 yr % Change	10 yr % Change	Rate Δ (Units/yr)	5 yr % Change	10 yr % Change	Rate Δ (Units/yr)	5 yr % Change	10 yr % Change	Rate Δ (Units/yr)	5 yr % Change	10 yr % Change	Rate Δ (Units/yr)	5 yr % Change	10 yr % Change
Nutrients																		
Ammonia Dissolved	-0.001	-2.993	-5.986	0.000	-1.913	-3.826	0.000	2.502	5.004	0.000	-2.541	-5.083	0.000	-5.829	-11.658	-0.001	-8.337	-16.674
Nitrate as N	0.000	-0.100	-0.200	-0.001	-2.860	-5.721	0.000	2.163	4.326	-0.005	-7.343	-14.687	0.000	-0.029	-0.058	0.000	0.097	0.194
Nitrogen Total	0.006	1.974	3.948	0.001	0.308	0.616	0.002	2.395	4.790	-0.016	-9.806	-19.611	0.013	5.901	11.803	0.007	4.068	8.137
Phosphorous Total	0.001	4.802	9.604	0.000	-1.201	-2.402	0.000	-3.914	-7.827	-0.002	-6.812	-13.623	0.000	-0.674	-1.347	-0.001	-6.654	-13.308
Phosphorous Total Dissolved	0.000	2.491	4.982	0.000	-6.394	-12.787	0.000	1.748	3.495	-0.001	-67.456	-134.91	0.000	-1.680	-3.361	0.000	-29.184	-58.368
Major Ions																		
Chloride Dissolved	0.329	5.460	10.920	-0.013	-1.871	-3.743	-0.014	-13.303	-26.605	0.033	2.492	4.985	0.105	6.333	12.666	0.149	6.076	12.153
Fluoride Dissolved	0.001	1.714	3.428	-0.001	-3.420	-6.841	0.000	-2.191	-4.383	-0.002	-8.410	-16.820	0.000	0.171	0.341	0.001	2.665	5.331
Sodium Dissolved/ Filtered	0.521	1.962	3.923	-0.082	-2.966	-5.933	0.003	0.150	0.300	0.003	0.181	0.362	0.101	1.433	2.866	0.172	4.437	8.875
Sulphate Dissolved	0.515	1.687	3.374	-0.157	-8.982	-17.964	-0.038	-7.138	-14.277	0.186	2.228	4.455	0.104	0.675	1.349	0.396	3.193	6.386
Total Dissolved Solids (TDS)	4.246	3.281	6.563	-0.339	-0.907	-1.814	-0.003	-0.009	-0.018	0.541	1.394	2.789	1.665	2.551	5.102	1.836	3.732	7.465
Physicals																		
Oxygen Dissolved	0.024	1.586	3.173	0.007	0.547	1.094	0.069	2.973	5.947	0.035	1.627	3.254	-0.009	-0.464	-0.928	0.009	0.371	0.741
pH - Field	0.008	0.510	1.021	0.009	0.542	1.083	0.006	0.338	0.676	0.002	0.100	0.199	0.006	0.378	0.755	0.007	0.420	0.840
Sodium Adsorption Ratio (SAR)	0.009	1.291	2.581	-0.002	-1.779	-3.557	0.000	0.032	0.064	0.000	-0.370	-0.740	0.004	1.799	3.598	0.005	4.017	8.033
Total Suspended Solids (TSS)	0.271	1.189	2.377	0.068	1.566	3.132	-0.035	-31.892	-63.785	-0.112	-0.590	-1.181	-0.184	-0.639	-1.278	-0.155	-1.375	-2.750

Legend	
	Significant Increasing
	Significant Decreasing
	Not Significant Increasing
	Not Significant Decreasing

Table G2: Trend Magnitude Table for Metals on Alberta/Saskatchewan Border – Flow-Weighted Trend

	Battle River			Beaver River			Cold River			North Saskatchewan River			Red Deer River at Bindloss			South Saskatchewan River		
	Rate Δ (Units/yr)	5 yr % Change	10 yr % Change	Rate Δ (Units/yr)	5 yr % Change	10 yr % Change	Rate Δ (Units/yr)	5 yr % Change	10 yr % Change	Rate Δ (Units/yr)	5 yr % Change	10 yr % Change	Rate Δ (Units/yr)	5 yr % Change	10 yr % Change	Rate Δ (Units/yr)	5 yr % Change	10 yr % Change
Aluminum Dissolved	-0.008	-0.725	-1.450	0.049	4.239	8.477	0.050	20.388	40.776	-1.340	-38.359	-76.718	0.227	8.990	17.980	0.197	7.575	15.150
Aluminum Total	-9.016	-7.042	-14.085	-1.069	-3.195	-6.390	-0.071	-6.975	-13.949	-6.948	-3.860	-7.721	-27.320	-10.811	-21.621	-16.160	-39.336	-78.672
Arsenic Dissolved	-0.029	-8.676	-17.353	0.000	-0.143	-0.286	-0.004	-2.267	-4.533	-0.010	-14.596	-29.191	0.006	4.801	9.601	-0.008	-9.171	-18.342
Arsenic Total	-0.053	-9.447	-18.893	-0.001	-0.463	-0.926	-0.007	-3.163	-6.326	-0.014	-6.743	-13.486	0.004	1.079	2.158	-0.020	-12.258	-24.517
Barium Dissolved	1.878	9.331	18.662	0.052	0.538	1.077	-0.002	-0.022	-0.045	-0.334	-2.576	-5.151	-0.047	-0.256	-0.511	0.158	1.027	2.054
Barium Total	0.815	3.014	6.028	0.018	0.163	0.326	-0.089	-1.235	-2.470	-0.200	-1.003	-2.006	-1.115	-3.690	-7.380	-0.619	-3.122	-6.245
Beryllium Dissolved	0.001	22.848	45.697	0.000	22.521	45.043				0.000	20.786	41.571	0.000	17.811	35.622			
Beryllium Total	0.001	5.865	11.730	0.000	12.282	24.563				0.000	2.429	4.858	-0.001	-3.092	-6.184	0.000	-3.267	-6.534
Boron Dissolved	-2.172	-5.740	-11.480	0.135	1.663	3.327	0.027	0.496	0.993	-0.206	-6.478	-12.956	0.371	6.979	13.958	-0.043	-1.079	-2.158
Boron Total	-2.464	-6.368	-12.735	0.172	2.131	4.262	0.054	0.980	1.960	-0.044	-1.240	-2.480	0.483	8.604	17.209	-0.100	-2.452	-4.905
Cadmium Dissolved	0.003	20.873	41.745	0.004	10.409	20.817	0.003	9.882	19.765	0.004	21.176	42.353	0.003	13.376	26.753	0.002	17.255	34.510
Cadmium Total	0.001	6.426	12.852	0.001	9.870	19.740	0.001	30.735	61.470	0.002	5.607	11.213	0.001	5.368	10.736	0.001	5.349	10.698
Chromium Dissolved	0.002	16.928	33.856	0.001	8.910	17.819	0.001	19.830	39.660	0.001	8.895	17.789	0.003	15.292	30.585	0.004	18.102	36.205
Chromium Total	-0.011	-5.499	-10.998	0.001	1.735	3.471	0.000	1.799	3.598	-0.003	-1.155	-2.310	-0.020	-5.534	-11.068	-0.012	-7.146	-14.292
Cobalt Dissolved	-0.004	-7.668	-15.335	0.000	-2.212	-4.423	0.000	16.226	32.453	-0.002	-20.531	-41.062	0.000	-2.198	-4.395	-0.002	-9.166	-18.331
Cobalt Total	-0.018	-7.428	-14.856	-0.003	-5.092	-10.184	0.000	-0.377	-0.754	-0.005	-2.637	-5.274	-0.016	-5.041	-10.081	-0.014	-12.419	-24.838
Copper Dissolved	0.008	2.667	5.335	0.013	12.018	24.036	0.012	24.804	49.608	-0.001	-0.568	-1.137	0.007	2.039	4.078	0.010	5.015	10.031
Copper Total	-0.026	-3.454	-6.908	0.010	5.264	10.529	0.009	15.789	31.578	-0.021	-3.457	-6.914	-0.041	-3.747	-7.495	-0.035	-7.895	-15.790
Iron Dissolved	-1.005	-14.235	-28.470	0.680	1.523	3.046	0.088	27.025	54.049	-0.342	-6.846	-13.691	0.307	6.515	13.030	0.266	11.663	23.326
Iron Total	-2.747	-0.700	-1.399	1.104	0.568	1.136	-0.361	-38.065	-76.130	-6.052	-1.588	-3.176	-29.560	-6.288	-12.577	-18.260	-9.014	-18.027
Lead Dissolved	-0.001	-21.990	-43.980	0.000	1.629	3.258				-0.001	-15.112	-30.223	0.000	1.838	3.676	0.000	0.126	0.252
Lead Total	-0.007	-2.730	-5.460	0.000	-0.169	-0.339				-0.005	-2.127	-4.255	-0.008	-0.960	-1.920	-0.017	-9.627	-19.254
Lithium Dissolved	-0.287	-2.153	-4.306	0.040	1.781	3.563	-0.045	-2.756	-5.512	-0.092	-9.819	-19.637	0.201	7.851	15.702	0.015	1.032	2.064
Lithium Total	-0.186	-1.320	-2.639	0.066	2.867	5.734	-0.036	-2.407	-4.815	-0.066	-5.195	-10.391	0.173	5.706	11.412	-0.001	-0.038	-0.077
Manganese Dissolved	0.352	4.141	8.281	0.782	6.256	12.513	0.040	31.203	62.406	-0.096	-25.036	-50.071	-0.015	-2.199	-4.398	0.031	9.202	18.404

	Battle River			Beaver River			Cold River			North Saskatchewan River			Red Deer River at Bindloss			South Saskatchewan River		
	Rate Δ (Units/yr)	5 yr % Change	10 yr % Change	Rate Δ (Units/yr)	5 yr % Change	10 yr % Change	Rate Δ (Units/yr)	5 yr % Change	10 yr % Change	Rate Δ (Units/yr)	5 yr % Change	10 yr % Change	Rate Δ (Units/yr)	5 yr % Change	10 yr % Change	Rate Δ (Units/yr)	5 yr % Change	10 yr % Change
Manganese Total	0.614	2.067	4.134	-2.391	-13.346	-26.693	-0.013	-5.930	-11.860	-0.479	-3.917	-7.834	-1.758	-9.503	-19.006	-0.701	-9.409	-18.819
Molybdenum Dissolved	-0.011	-3.727	-7.454	-0.002	-1.721	-3.441	-0.005	-5.305	-10.611	-0.017	-7.991	-15.982	-0.022	-7.992	-15.984	-0.025	-10.535	-21.070
Molybdenum Total	0.006	1.996	3.992	0.000	0.321	0.643	-0.006	-6.315	-12.631	-0.012	-5.699	-11.399	-0.010	-4.228	-8.456	-0.018	-8.169	-16.337
Nickel Dissolved	0.020	2.779	5.557	0.006	4.475	8.950	0.005	14.650	29.301	-0.009	-4.835	-9.670	0.004	1.285	2.570	0.005	2.507	5.014
Nickel Total	-0.015	-1.283	-2.567	0.000	-0.121	-0.241	0.001	4.796	9.591	-0.020	-2.823	-5.646	-0.044	-4.160	-8.321	-0.051	-11.512	-23.024
Selenium Dissolved	0.004	5.662	11.324	0.000	0.000	0.000				-0.014	-29.824	-59.648	0.005	6.480	12.961	0.009	6.783	13.567
Selenium Total	0.003	4.045	8.090	0.001	2.384	4.768				-0.013	-20.701	-41.402	0.007	7.274	14.549	0.009	7.117	14.234
Silver Dissolved	0.000	-0.989	-1.977															
Silver Total	0.000	-15.753	-31.506	0.000	-2.191	-4.382				0.000	-8.376	-16.752	0.000	-4.581	-9.161	0.000	-6.232	-12.464
Thallium Dissolved	0.001	41.916	83.832	0.000	33.925	67.850				0.000	20.256	40.512	0.000	10.049	20.097	0.000	25.259	50.519
Thallium Total	0.000	8.585	17.170	0.000	21.446	42.891				0.000	3.626	7.252	0.000	0.422	0.844	0.000	0.717	1.433
Uranium Dissolved	0.036	12.733	25.466	0.001	1.608	3.216	0.000	-0.333	-0.665	-0.001	-1.109	-2.217	0.024	8.716	17.433	0.010	5.270	10.540
Uranium Total	0.035	11.008	22.016	0.001	2.563	5.126	0.000	-2.618	-5.235	0.002	1.387	2.774	0.025	7.211	14.422	0.008	3.813	7.625
Vanadium Dissolved	-0.017	-10.191	-20.383	-0.001	-0.978	-1.956	-0.002	-7.872	-15.743	-0.012	-23.032	-46.065	-0.008	-8.217	-16.434	-0.006	-12.408	-24.816
Vanadium Total	-0.066	-11.112	-22.225	-0.004	-2.705	-5.411	-0.002	-9.077	-18.154	-0.027	-5.230	-10.460	-0.074	-9.721	-19.442	-0.044	-14.181	-28.362
Zinc Dissolved	0.020	13.400	26.800	0.042	16.621	33.242	0.019	20.079	40.159	0.044	19.183	38.365	0.027	14.379	28.758	0.042	14.477	28.953
Zinc Total	-0.061	-4.274	-8.548	0.001	0.127	0.253				-0.038	-2.259	-4.519	-0.056	-2.508	-5.017	-0.061	-11.178	-22.357

Legend	
	Significant Increasing
	Significant Decreasing
	Not Significant Increasing
	Not Significant Decreasing

Table G3: Trend Magnitude Table for Non-Metals on Saskatchewan/Manitoba Border – Flow-Weighted Trend

	Assiniboine			Carrot			Churchill			Qu'Appelle			Red Deer at Erwood			Saskatchewan		
	Rate Δ (Units/yr)	5 yr % Change	10 yr % Change	Rate Δ (Units/yr)	5 yr % Change	10 yr % Change	Rate Δ (Units/yr)	5 yr % Change	10 yr % Change	Rate Δ (Units/yr)	5 yr % Change	10 yr % Change	Rate Δ (Units/yr)	5 yr % Change	10 yr % Change	Rate Δ (Units/yr)	5 yr % Change	10 yr % Change
Nutrients																		
Ammonia Dissolved	0.000	0.767	1.533	0.001	2.268	4.536	-0.001	-59.333	-118.667	0.000	-21.385	-42.769	-0.001	-6.341	-12.682	-0.001	-6.441	-12.882
Nitrate as N	0.000	-0.160	-0.320	0.000	-0.067	-0.135	0.000	-0.451	-0.901	0.000	0.040	0.079	0.000	-0.128	-0.256	0.000	-1.046	-2.093
Nitrogen Total	0.030	7.874	15.748	0.024	7.218	13.847	-0.001	-0.943	-1.885	0.014	3.778	7.555	0.013	5.509	11.018	0.000	0.361	0.721
Phosphorous Total	0.000	0.604	1.208	0.001	4.169	8.338	0.000	0.156	0.313	-0.001	-1.564	-3.127	0.000	2.782	5.564	0.000	-3.421	-6.841
Phosphorous Total Dissolved	0.000	-1.644	-3.289	0.000	4.281	8.562	0.000	0.073	0.146	0.000	-1.233	-2.466	0.000	2.242	4.483	0.000	-3.869	-7.738
Major Ions																		
Chloride Dissolved	0.244	5.056	10.112	-1.434	-7.665	-15.330	0.002	0.597	1.194	-0.133	-1.156	-2.311	0.036	3.584	7.169	0.058	3.242	6.485
Fluoride Dissolved	0.001	1.926	3.852	0.001	2.075	4.150	0.000	1.991	3.981	0.000	-1.509	-3.017	0.001	2.738	5.475	0.000	1.111	2.221
Sodium Dissolved/ Filtered	0.411	4.234	8.467	-0.700	-4.786	-9.571	0.006	0.802	1.605	-0.524	-1.768	-3.536	0.096	2.835	5.671	0.064	1.524	3.048
Sulphate Dissolved	1.481	2.698	5.397	0.286	1.150	2.301	-0.005	-1.019	-2.038	0.954	1.061	2.122	0.245	1.354	2.707	0.284	2.229	4.457
Total Dissolved Solids (TDS)	5.282	3.551	7.101	0.509	0.437	0.874	0.068	0.454	0.907	0.523	0.257	0.515	4.472	5.918	11.835	0.904	1.673	3.346
Physicals																		
Oxygen Dissolved	-0.027	-1.458	-2.916	-0.051	-4.400	-8.800	-0.015	-0.677	-1.355	-0.018	-1.026	-2.053	-0.006	-0.251	-0.501	-0.012	-0.572	-1.144
pH - Field	0.003	0.159	0.319	0.003	0.216	0.432	0.014	0.850	1.700	0.001	0.050	0.099	0.004	0.255	0.511	0.007	0.432	0.864
Sodium Adsorption Ratio (SAR)	0.003	1.900	3.799	-0.015	-4.575	-9.150	0.001	1.503	3.006	-0.017	-3.070	-6.139	0.002	2.312	4.623	0.002	1.303	2.605
Total Suspended Solids (TSS)	0.113	1.589	3.178	0.120	1.952	3.905	0.011	1.466	2.932	0.105	1.002	2.004	0.016	0.472	0.944	-0.092	-0.981	-1.961

Legend	
	Significant Increasing
	Significant Decreasing
	Not Significant Increasing
	Not Significant Decreasing

Table G4: Trend Magnitude Table for Metals on Saskatchewan/Manitoba Border – Flow-Weighted Trend

	Assiniboine River			Carrot River			Churchill River			Qu'Appelle River			Red Deer River at Erwood			Saskatchewan River		
	Rate Δ (Units/yr)	5 yr % Change	10 yr % Change	Rate Δ (Units/yr)	5 yr % Change	10 yr % Change	Rate Δ (Units/yr)	5 yr % Change	10 yr % Change	Rate Δ (Units/yr)	5 yr % Change	10 yr % Change	Rate Δ (Units/yr)	5 yr % Change	10 yr % Change	Rate Δ (Units/yr)	5 yr % Change	10 yr % Change
Aluminum Dissolved	-0.140	-4.673	-9.345	-0.132	-22.298	-44.596	-0.716	-26.279	-52.558	-0.024	-3.574	-7.149	0.111	11.173	22.346	0.016	1.105	2.209
Aluminum Total	-2.231	-6.609	-13.218	-6.245	-18.906	-37.813	-12.600	-101.124	-202.247	-31.520	-81.689	-163.379	0.037	0.093	0.186	-32.090	-66.618	133.236
Arsenic Dissolved	-0.034	-6.867	-13.734	-0.005	-1.449	-2.898	0.001	2.383	4.766	0.292	17.966	35.932	0.004	1.618	3.236	0.002	0.920	1.841
Arsenic Total	-0.053	-9.073	-18.147	-0.013	-2.608	-5.217	-0.002	-3.382	-6.765	0.151	9.294	18.587	0.002	0.541	1.082	-0.030	-14.270	-28.540
Barium Dissolved	0.972	8.237	16.473	2.043	12.980	25.959	0.185	5.923	11.846	0.763	6.724	13.448	0.495	6.699	13.397	0.493	3.006	6.013
Barium Total	0.566	4.369	8.737	1.666	9.471	18.941	0.039	1.159	2.317	-1.058	-8.152	-16.304	0.202	2.342	4.685	-0.971	-5.568	-11.137
Beryllium Dissolved	0.000	31.532	63.063	0.001	32.570	65.141	0.000	23.493	46.987	0.001	39.663	79.325	0.000	23.824	47.647	0.000	22.263	44.525
Beryllium Total	0.001	16.716	33.432	0.000	6.722	13.444	0.000	-37.260	-74.520	-0.001	-10.476	-20.952	0.000	10.704	21.408	-0.002	-43.026	-86.053
Boron Dissolved	0.573	3.727	7.455	1.939	11.938	23.876	0.199	7.694	15.388	-3.086	-7.903	-15.805	1.078	10.304	20.609	0.565	9.354	18.708
Boron Total	-0.391	-2.629	-5.258	1.420	8.634	17.268	0.196	7.036	14.072	-4.483	-11.233	-22.466	0.403	3.977	7.953	0.279	4.834	9.667
Cadmium Dissolved	-0.001	-10.812	-21.625	-0.001	-11.228	-22.457	-0.001	-19.272	-38.544	-0.002	-25.480	-50.960	-0.001	-10.707	-21.415	0.000	-4.941	-9.882
Cadmium Total	0.000	-7.187	-14.374	-0.001	-23.310	-46.619	0.000	-11.157	-22.314	-0.002	-37.211	-74.422	0.000	-0.653	-1.305	-0.002	-47.926	-95.852
Chromium Dissolved	0.002	0.158	0.317	-0.009	-73.607	-147.214	0.001	3.430	6.859	0.001	9.341	18.681	-0.002	-10.624	-21.248	0.000	-0.525	-1.051
Chromium Total	-0.004	-4.948	-9.895	-0.003	-4.220	-8.439	-0.029	-77.730	-155.459	-0.032	-37.459	-74.919	0.003	2.291	4.582	-0.059	-61.175	122.349
Cobalt Dissolved	0.004	5.055	10.110	0.003	4.736	9.472	0.000	-0.189	-0.378	0.016	24.057	48.114	0.000	-1.617	-3.233	0.000	0.172	0.345
Cobalt Total	0.002	1.695	3.390	0.000	-0.460	-0.920	-0.006	-74.484	-148.967	-0.016	-13.329	-26.657	0.001	1.744	3.487	-0.026	-48.005	-96.010
Copper Dissolved	0.019	6.241	12.483	0.015	6.693	13.385	0.008	5.672	11.344	0.030	9.256	18.512	0.019	8.924	17.849	0.023	7.883	15.766
Copper Total	0.009	2.208	4.417	0.004	1.353	2.707	-0.001	-0.605	-1.211	-0.043	-10.433	-20.867	0.011	3.545	7.090	-0.049	-12.548	-25.097
Iron Dissolved	0.236	2.030	4.059	-7.695	-21.687	-43.374	-0.903	-28.853	-57.706	0.245	12.138	24.277	-4.060	-37.305	-74.609	0.148	2.533	5.067
Iron Total	14.040	10.700	21.399	-1.038	-0.425	-0.851	-15.770	-100.542	-201.084	-37.580	-38.802	-77.605	-6.241	-3.992	-7.985	-50.000	-48.914	-97.828
Lead Dissolved	-0.001	-21.673	-43.347	-0.003	-35.694	-71.389	-0.001	-33.544	-67.088	0.001	12.302	24.604	-0.004	-76.526	153.053	0.000	-8.488	-16.976
Lead Total	0.001	1.967	3.934	-0.005	-9.307	-18.613	-0.005	-56.834	-113.668	-0.026	-36.019	-72.039	-0.001	-1.561	-3.122	-0.034	-54.811	109.622
Lithium Dissolved	1.466	13.089	26.179	1.046	13.628	27.255	0.028	3.490	6.981	0.491	2.708	5.417	0.578	10.571	21.142	0.367	13.817	27.635

	Assiniboine River			Carrot River			Churchill River			Qu'Appelle River			Red Deer River at Erwood			Saskatchewan River		
	Rate Δ (Units/yr)	5 yr % Change	10 yr % Change	Rate Δ (Units/yr)	5 yr % Change	10 yr % Change	Rate Δ (Units/yr)	5 yr % Change	10 yr % Change	Rate Δ (Units/yr)	5 yr % Change	10 yr % Change	Rate Δ (Units/yr)	5 yr % Change	10 yr % Change	Rate Δ (Units/yr)	5 yr % Change	10 yr % Change
Lithium Total	1.041	9.188	18.376	0.789	10.043	20.087	0.009	1.143	2.287	-0.312	-1.653	-3.306	0.278	5.021	10.042	0.241	8.940	17.880
Manganese Dissolved	4.029	14.214	28.428	1.960	1.965	3.930	-0.065	-41.631	-83.261	7.430	42.574	85.147	-0.263	-7.711	-15.422	0.073	3.776	7.552
Manganese Total	5.686	13.954	27.908	2.582	2.336	4.672	-0.899	-41.328	-82.657	1.059	3.008	6.015	-1.478	-8.204	-16.407	-1.416	-24.464	-48.929
Molybdenum Dissolved	-0.027	-5.395	-10.790	-0.016	-6.003	-12.007	0.003	8.910	17.819	-0.040	-4.538	-9.075	0.008	2.161	4.323	-0.005	-2.212	-4.424
Molybdenum Total	-0.044	-8.610	-17.219	-0.022	-8.259	-16.518	0.002	6.736	13.472	-0.059	-6.705	-13.410	-0.005	-1.409	-2.819	-0.009	-4.121	-8.242
Nickel Dissolved	-0.006	-1.130	-2.259	-0.006	-1.240	-2.481	-0.005	-9.714	-19.429	0.078	10.366	20.731	-0.036	-10.980	-21.960	-0.001	-0.370	-0.740
Nickel Total	-0.011	-1.762	-3.524	-0.015	-2.587	-5.173	-0.018	-26.696	-53.393	-0.056	-6.236	-12.473	-0.042	-9.568	-19.135	-0.090	-23.048	-46.097
Selenium Dissolved	0.010	8.329	16.657	-0.001	-0.631	-1.261				0.035	16.396	32.791	0.009	14.211	28.423	0.009	13.715	27.429
Selenium Total	0.013	10.121	20.243	0.000	-0.122	-0.244				0.028	12.580	25.160	0.010	13.720	27.441	0.007	10.346	20.693
Silver Dissolved																		
Silver Total	0.000	0.241	0.481	0.000	-2.991	-5.982				0.000	-22.837	-45.674	0.000	4.102	8.205	0.000	-44.528	-89.056
Thallium Dissolved	0.001	27.346	54.692	0.001	35.116	70.232	0.000	7.406	14.811	0.000	29.139	58.277	0.000	12.923	25.845	0.000	16.637	33.274
Thallium Total	0.001	19.484	38.968	0.000	10.313	20.627	0.000	-60.286	-120.571	0.000	-7.088	-14.175	0.000	9.479	18.958	-0.001	-24.717	-49.435
Uranium Dissolved	0.206	18.032	36.065	0.090	23.430	46.859	0.003	0.498	0.997	0.144	18.961	37.922	0.097	28.584	57.167	0.028	13.521	27.043
Uranium Total	0.172	15.167	30.335	0.079	20.187	40.374	-0.001	-5.645	-11.290	0.109	14.345	28.691	0.083	23.928	47.856	0.020	9.606	19.212
Vanadium Dissolved	-0.001	-0.290	-0.581	-0.007	-6.479	-12.958	-0.007	-48.883	-97.766	0.103	18.468	36.937	-0.001	-0.796	-1.593	-0.003	-3.129	-6.257
Vanadium Total	-0.012	-3.177	-6.353	-0.031	-11.958	-23.916	-0.025	-81.686	-163.371	-0.040	-5.480	-10.960	-0.007	-2.376	-4.751	-0.091	-42.076	-84.151
Zinc Dissolved	-0.041	-16.035	-32.071	-0.039	-13.625	-27.249	-0.023	-17.348	-34.696	-0.045	-25.273	-50.546	-0.008	-2.765	-5.531	0.000	0.256	0.512
Zinc Total	0.028	4.609	9.218	-0.033	-7.469	-14.938	-0.040	-33.167	-66.333	-0.200	-35.608	-71.217	0.004	0.538	1.076	-0.207	-46.622	-93.243

Legend	
	Significant Increasing
	Significant Decreasing
	Not Significant Increasing
	Not Significant Decreasing

Appendix H: 2008 and 2013 Trending Directional Change Comparison

Table H1: Trending Directional Changes for Non-Metals on Alberta/Saskatchewan Border

Parameter	Battle		Beaver		Cold		North Saskatchewan		Red Deer (AB)		South Saskatchewan	
	2008	2013	2008	2013	2008	2013	2008	2013	2008	2013	2008	2013
Nutrients												
Ammonia Dissolved	↓	↓	↓	↓	↑	↔	↔	↔	↓	↓	↓	↓
Nitrate as N	↓	↓	↓	↓	↔	↑	↓	↓	↓	↓	↔	↔
Nitrogen Total	↔	↔	↔	↔	↑	↑	↓	↓	↔	↑	↑	↑
Phosphorous Total	↑	↑	↔	↔	↔	↔	↓	↓	↓	↔	↓	↓
Phosphorous Total Dissolved	↔	↑	↓	↓	↔	↔	↓	↓	↓	↓	↓	↓
Major Ions												
Chloride Dissolved	↑	↑	↔	↓	↓	↓	↔	↑	↑	↑	↑	↑
Fluoride Dissolved	↑	↑	↓	↓	↑	↔	↓	↓	↑	↔	↑	↑
Sodium Dissolved/Filtered	↑	↑	↓	↓	↔	↔	↔	↔	↔	↑	↑	↑
Sulphate Dissolved	↑	↑	↓	↓	↓	↓	↑	↑	↔	↔	↑	↑
Total Dissolved Solids (TDS)	↑	↑	↔	↓	↔	↔	↑	↑	↑	↑	↑	↑
Physicals												
Oxygen Dissolved	↔	↔	↔	↔	↑	↑	↔	↑	↔	↔	↔	↔
pH – Field	↑	↑	↑	↑	↑	↔	↑	↔	↑	↑	↑	↑
Sodium Adsorption Ratio (SAR)	↑	↑	↓	↓	↔	↔	↔	↔	↔	↑	↑	↑
Total Suspended Solids (TSS)	↑	↑	↑	↑	↔	↓	↔	↔	↔	↔	↔	↓

	No Seasonality
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Table H2: Trending Directional Changes for Non-Metals on Saskatchewan/Manitoba Border.

Parameter	Assiniboine		Carrot		Churchill		Qu'Appelle		Red Deer MB		Saskatchewan River	
	2008	2013	2008	2013	2008	2013	2008	2013	2008	2013	2008	2013
Nutrients												
Ammonia Dissolved	↔	↑	↔	↑	↓	↓	↔	↔	↓	↓	↓	↓
Nitrate as N	↓	↔	↓	↔	↔	↓	↔	↔	↓	↓	↓	↓
Nitrogen Total	↔	↑	↑	↑	↔	↔	↔	↑	↔	↑	↔	↔
Phosphorous Total	↔	↔	↑	↑	↔	↔	↓	↓	↑	↑	↓	↓
Phosphorous Total Dissolved	↔	↔	↑	↑	↔	↔	↓	↔	↑	↑	↓	↓
Major Ions												
Chloride Dissolved	↑	↑	↓	↓	↔	↔	↔	↔	↑	↑	↑	↑
Fluoride Dissolved	↑	↑	↑	↑	↑	↑	↔	↓	↑	↑	↑	↑
Sodium Dissolved/Filtered	↑	↑	↓	↓	↔	↔	↓	↓	↑	↑	↔	↑
Sulphate Dissolved	↑	↑	↔	↑	↔	↔	↔	↑	↔	↔	↑	↑
Total Dissolved Solids (TDS)	↑	↑	↔	↔	↔	↔	↔	↔	↑	↑	↑	↑
Physicals												
Oxygen Dissolved	↓	↓	↔	↓	↔	↔	↓	↔	↔	↔	↓	↔
pH – Field	↔	↑	↑	↑	↑	↑	↔	↔	↔	↑	↑	↑
Sodium Adsorption Ratio (SAR)	↑	↑	↓	↓	↑	↑	↔	↓	↑	↑	↔	↑
Total Suspended Solids (TSS)	↑	↑	↑	↑	↔	↔	↔	↔	↔	↔	↔	↔

	No Seasonality
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Table H3: Trend Slope Comparison for Non-Metals on Alberta/Saskatchewan Border between the 2008 and the 2013 Trend Results.

Parameter	Battle River		Beaver River		Cold River		North Saskatchewan River		Red Deer River at Bindloss		South Saskatchewan River	
	2008 Slope	2013 Slope	2008 Slope	2013 Slope	2008 Slope	2013 Slope	2008 Slope	2013 Slope	2008 Slope	2013 Slope	2008 Slope	2013 Slope
Nutrients												
Ammonia Dissolved	-0.000997	-0.0005093	-0.001061	-0.0004524	0.0005489	0.00004462	-0.0003096	-0.0002751	-0.000893	-0.0003711	-0.001221	-0.0007969
Nitrate as N	-0.000076	-0.00003993	-0.001441	-0.0009144	0.00007914	0.0001705	-0.006197	-0.00475	-0.000052	-0.00001688	0.00002984	0.00009782
Nitrogen Total	-0.006245	0.00603	-0.002892	0.0006401	0.002242	0.002073	-0.02225	-0.01598	0.008156	0.01347	0.008935	0.007188
Phosphorous Total	0.0008223	0.0009036	-0.0002472	-0.0002256	-0.0000164	-0.0001148	-0.002085	-0.001796	-0.000367	-0.000215	-0.001228	-0.0009238
Phosphorous Total Dissolved	0.00003676	0.0001449	-0.000498	-0.000406	-0.00004868	0.00003204	-0.001425	-0.001158	-0.000099	-0.00006245	-0.000266	-0.0002432
Major Ions												
Chloride Dissolved	0.2969	0.3286	-0.009358	-0.0129	-0.0125	-0.01399	0.01608	0.03329	0.0908	0.1049	0.1383	0.1494
Fluoride Dissolved	0.001204	0.0006657	-0.000249	-0.0006128	0.00000073	-0.0003634	-0.000575	-0.001647	0.0005605	0.00004079	0.001244	0.0005886
Sodium Dissolved/ Filtered	0.4522	0.5205	-0.08433	-0.08181	0.01288	0.002631	0.0005159	0.003335	0.01667	0.1008	0.1417	0.1721
Sulphate Dissolved	0.3392	0.5152	-0.168	-0.1568	-0.0676	-0.03794	0.3305	0.1862	-0.07328	0.1037	0.2974	0.3964
Total Dissolved Solids (TDS)	3.822	4.246	-0.222	-0.3385	0.1485	-0.002628	0.7868	0.5412	1.337	1.665	1.668	1.836
Physicals												
Oxygen Dissolved	0.03594	0.024	0.03674	0.007462	0.08753	0.0686	0.01741	0.03491	-0.01928	-0.008781	-0.01396	0.008557
pH - Field	0.01343	0.00825	0.01266	0.008623	0.01957	0.00566	0.00963	0.001566	0.008754	0.006168	0.008335	0.006971
Sodium Adsorption Ratio (SAR)	0.00869	0.008774	-0.001625	-0.001657	0.0002721	0.00002176	-0.0006459	-0.0002355	0.0006872	0.003781	0.00418	0.005041
Total Suspended Solids (TSS)	0.3053	0.2706	0.06881	0.06844	-0.001492	-0.03455	-0.09624	-0.1117	-0.1749	-0.1838	-0.03039	-0.1545

Legend	
Significant Increasing	
Significant Decreasing	
Non-Significant Slope	

Table H4: Trend Slope Comparison for Non-Metals on Saskatchewan/Manitoba Border between the 2008 and the 2013 Trend Results.

Parameter	Assiniboine River		Carrot River		Churchill River		Qu'Appelle River		Red Deer River MB		Saskatchewan River	
	2008 Slope	2013 Slope	2008 Slope	2013 Slope	2008 Slope	2013 Slope	2008 Slope	2013 Slope	2008 Slope	2013 Slope	2008 Slope	2013 Slope
Nutrients												
Ammonia Dissolved	0.00009451	0.0004494	0.000232	0.001004	-0.001445	-0.001157	-0.00007681	-0.00007841	-0.000908	-0.000502	-0.000812	-0.0005127
Nitrate as N	-0.000189	-0.0001116	-0.000173	-0.00002501	-0.00001602	-0.00001983	-0.00003444	0.00002618	-0.000085	-0.00004719	-0.000511	-0.000307
Nitrogen Total	0.009502	0.02982	0.0273	0.02277	-0.001717	-0.0007428	0.0009383	0.01352	0.001495	0.01254	-0.0008883	0.0004969
Phosphorous Total	0.0002115	0.0001523	0.001208	0.001196	0.00002955	0.000004534	-0.002471	-0.0007623	0.0002274	0.0003343	-0.000324	-0.0003619
Phosphorous Total Dissolved	-0.00003556	-0.0001669	0.0003758	0.0003796	0.00002012	0.00000084	-0.001978	-0.0004609	0.0001251	0.0001543	-0.000046	-0.00006268
Major Ions												
Chloride Dissolved	0.2281	0.2438	-1.581	-1.434	0.001848	0.001573	0.01377	-0.1325	0.03487	0.03564	0.04454	0.05844
Fluoride Dissolved	0.001186	0.0005971	0.001082	0.000604	0.0005355	0.0003185	0.000262	-0.0004727	0.001058	0.0006342	0.0009021	0.0002488
Sodium Dissolved/ Filtered	0.2992	0.4113	-0.9035	-0.7004	0.002892	0.006463	-0.5096	-0.5242	0.09519	0.09598	0.02675	0.06351
Sulphate Dissolved	0.6101	1.481	-0.1371	0.2861	-0.0003778	-0.005096	0.2122	0.9539	-0.1954	0.2446	0.189	0.2841
Total Dissolved Solids (TDS)	2.987	5.282	-0.6673	0.5086	0.00221	0.06796	-1.199	0.5227	3.96	4.472	0.6596	0.9035
Physicals												
Oxygen Dissolved	-0.04643	-0.02632	-0.02797	-0.05125	-0.02494	-0.0148	-0.03806	-0.01822	-0.006108	-0.005715	-0.03791	-0.01162
pH - Field	0.0007872	0.002501	0.004507	0.003272	0.01294	0.01356	-0.001219	0.0007983	0.003004	0.004138	0.007655	0.00691
Sodium Adsorption Ratio (SAR)	0.004109	0.003429	-0.02428	-0.01465	0.0007124	0.000759	-0.006846	-0.0172	0.001834	0.001938	0.00082	0.001722
Total Suspended Solids (TSS)	0.08931	0.1125	0.1558	0.1201	0.00624	0.0107	0.1194	0.1051	-0.009742	0.0155	-0.04343	-0.0923

Legend	
Significant Increasing	
Significant Decreasing	
Non-Significant Slope	



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