

Appendix A - Long-term Trends in Water Quality Parameters

Appendix A - Section I. Blocked seasonal Kendall long-term trends in water quality for all tributaries and the Virginia Mainstem Chesapeake Bay (1985-2015). Parameters are as follows: STN=Surface total nitrogen, BTN=Bottom total nitrogen, SDIN=Surface dissolved inorganic nitrogen, BDIN=Bottom dissolved inorganic nitrogen, STP=Surface total phosphorus, BTP=Bottom total phosphorus, SPO4F=Surface dissolved inorganic phosphorus, BPO4F=Bottom dissolved inorganic phosphorus, STSS=Surface total suspended solids, BTSS=Bottom total suspended solids.

Segment	Parameter	'93		'93		'10		'10		Trend		Combined	
		Trend	'93	Trend	Trend	'10	Trend	Comparison	Trend	Trend	Comparison	Trend	
		P value	Slope	Direction	P value	Slope	Direction	P value	Comparison	P value	Direction		
APPTF	STN	0.1637	-0.0113	No Trend	<0.0001	-0.0084	Improving	0.0005	Different	<0.0001	Improving	95	
APPTF	BTN	0.3498	-0.0090	No Trend	<0.0001	-0.0090	Improving	<0.0001	Different	<0.0001	Improving	95	
APPTF	SDIN	0.1968	-0.0057	No Trend	0.0145	-0.0048	No Trend	0.0440	Same	0.0068	Improving		
APPTF	BDIN	0.1162	-0.0100	No Trend	0.0202	-0.0049	No Trend	0.0743	Same	0.0074	Improving		
APPTF	STP	0.7501	0.0000	No Trend	<0.0001	-0.0017	Improving	<0.0001	Different	<0.0001	Improving	95	
APPTF	BTP	0.0346	0.0025	No Trend	<0.0001	-0.0015	Improving	<0.0001	Different	<0.0001	Improving	95	
APPTF	SPO4F	0.0005	-0.0013	Improving	<0.0001	-0.0006	Improving	<0.0001	Different	<0.0001	Improving	*	
APPTF	BPO4F	<0.0001	-0.0017	Improving	<0.0001	-0.0006	Improving	<0.0001	Different	<0.0001	Improving	*	
JMSTF2	STN	0.1188	-0.0225	No Trend	<0.0001	-0.0119	Improving	<0.0001	Different	<0.0001	Improving	95	
JMSTF2	BTN	0.1378	-0.0127	No Trend	<0.0001	-0.0151	Improving	<0.0001	Different	<0.0001	Improving	95	
JMSTF2	SDIN	0.0125	-0.0225	No Trend	<0.0001	-0.0070	Improving	0.0025	Different	<0.0001	Improving	95	
JMSTF2	BDIN	0.0031	-0.0228	Improving	0.0001	-0.0071	Improving	0.0051	Different	<0.0001	Improving	*	
JMSTF2	STP	0.1733	0.0013	No Trend	<0.0001	-0.0021	Improving	<0.0001	Different	<0.0001	Improving	95	
JMSTF2	BTP	0.0008	0.0050	Degrading	<0.0001	-0.0024	Improving	<0.0001	Different	<0.0001	D85 - I95		
JMSTF2	SPO4F	<0.0001	-0.0025	Improving	<0.0001	-0.0007	Improving	<0.0001	Different	<0.0001	Improving	*	
JMSTF2	BPO4F	<0.0001	-0.0017	Improving	<0.0001	-0.0008	Improving	<0.0001	Different	<0.0001	Improving	*	
JMSTF1	STN	0.0002	-0.0250	Improving	0.0017	-0.0066	Improving	0.0571	Same	<0.0001	Improving		
JMSTF1	BTN	<0.0001	-0.0696	Improving	0.0044	-0.0064	Improving	0.4358	Same	<0.0001	Improving		
JMSTF1	SDIN	0.0004	-0.0200	Improving	0.0655	-0.0030	No Trend	0.4521	Same	0.0054	Improving		
JMSTF1	BDIN	<0.0001	-0.0563	Improving	0.0746	-0.0037	No Trend	0.9473	Same	0.0008	Improving		
JMSTF1	STP	<0.0001	-0.0125	Improving	<0.0001	-0.0025	Improving	<0.0001	Different	<0.0001	Improving	*	
JMSTF1	BTP	<0.0001	-0.0188	Improving	<0.0001	-0.0024	Improving	<0.0001	Different	<0.0001	Improving	*	
JMSTF1	SPO4F	<0.0001	-0.0110	Improving	<0.0001	-0.0016	Improving	<0.0001	Different	<0.0001	Improving	*	
JMSTF1	BPO4F	<0.0001	-0.0150	Improving	<0.0001	-0.0014	Improving	<0.0001	Different	<0.0001	Improving	*	
CHKOH	STN	0.0440	-0.0338	No Trend	0.0089	-0.0035	Improving	0.0253	Same	0.0034	Improving		
CHKOH	BTN	0.2880	-0.0250	No Trend	0.0096	-0.0059	Improving	0.0176	Same	0.0062	Improving		
CHKOH	SDIN	0.0520	0.0000	No Trend	0.0620	0.0007	No Trend	0.0343	Same	0.1135	No Trend		
CHKOH	BDIN	0.0742	0.0000	No Trend	0.9921	0.0000	No Trend	0.8052	Same	0.8205	No Trend		
CHKOH	STP	0.0311	0.0025	No Trend	0.0034	-0.0008	Improving	0.0012	Different	0.0110	Improving	95	
CHKOH	BTP	0.0315	0.0050	No Trend	0.0029	-0.0012	Improving	0.0010	Different	0.0099	Improving	95	
CHKOH	SPO4F	0.1546	0.0000	No Trend	<0.0001	-0.0002	Improving	0.0001	Different	<0.0001	Improving	95	
CHKOH	BPO4F	0.0335	0.0000	No Trend	0.0009	-0.0001	Improving	0.0024	Different	0.0004	Improving	95	
JMSOH	STN	0.1549	-0.0096	No Trend	0.0649	-0.0030	No Trend	0.1812	Same	0.0284	No Trend		
JMSOH	BTN	0.0373	0.0200	No Trend	0.0274	-0.0057	No Trend	0.0064	Different	0.1370	No Trend	*	
JMSOH	SDIN	0.0008	-0.0104	Improving	0.5872	-0.0006	No Trend	0.6183	Same	0.1250	No Trend		
JMSOH	BDIN	0.0021	-0.0121	Improving	0.3673	-0.0010	No Trend	0.9841	Same	0.0804	No Trend		
JMSOH	STP	<0.0001	0.0050	Degrading	0.0029	-0.0006	Improving	<0.0001	Different	0.1003	D85 - I95		
JMSOH	BTP	<0.0001	0.0117	Degrading	0.0532	-0.0010	No Trend	0.0006	Different	0.7949	Degrading	85	
JMSOH	SPO4F	0.1452	0.0000	No Trend	0.4548	-0.0001	No Trend	0.2593	Same	0.7571	No Trend		
JMSOH	BPO4F	0.4470	0.0000	No Trend	0.5721	0.0000	No Trend	0.4452	Same	0.7475	No Trend		

Appendix A - Section I (continued). Blocked seasonal Kendall long-term trends in water quality for all tributaries and the Virginia Mainstem Chesapeake Bay (1985-2015). Parameters are as follows: STN=Surface total nitrogen, BTN=Bottom total nitrogen, SDIN=Surface dissolved inorganic nitrogen, BDIN=Bottom dissolved inorganic nitrogen, STP=Surface total phosphorus, BTP=Bottom total phosphorus, SPO4F=Surface dissolved inorganic phosphorus, BPO4F=Bottom dissolved inorganic phosphorus, STSS=Surface total suspended solids, BTSS=Bottom total suspended solids.

Segment	Parameter	'93		'93	Trend	'10		'10	Trend	Comparison	Combined		
		P value	Slope			P value	Slope				Trend	P value	Combined Trend Direction
JMSMH	STN	0.0211	0.0115	No Trend		0.1780	-0.0017	No Trend		0.0493	Same	0.5404	No Trend
JMSMH	BTN	0.0058	0.0183	Degrading		0.0153	-0.0035	No Trend		0.0017	Different	0.1302	Degrading 85
JMSMH	SDIN	0.9101	0.0000	No Trend		0.0908	-0.0016	No Trend		0.0949	Same	0.1120	No Trend
JMSMH	BDIN	1.0000	0.0000	No Trend		0.1188	-0.0009	No Trend		0.1360	Same	0.1307	No Trend
JMSMH	STP	<0.0001	0.0036	Degrading		0.0073	-0.0004	Improving		<0.0001	Different	0.2199	D85 - I95
JMSMH	BTP	<0.0001	0.0033	Degrading		0.0010	-0.0008	Improving		<0.0001	Different	0.0606	D85 - I95
JMSMH	SPO4F	0.0020	0.0013	Degrading		0.1645	-0.0001	No Trend		0.0295	Same	0.6164	No Trend
JMSMH	BPO4F	0.0009	0.0006	Degrading		0.2582	-0.0001	No Trend		0.0479	Same	0.8388	No Trend
JMSPH	STN	0.8096	0.0010	No Trend	<0.0001	-0.0029		Improving		<0.0001	Different	<0.0001	Improving 95
JMSPH	BTN	0.3202	0.0049	No Trend	0.0022	-0.0023		Improving		0.0013	Different	0.0082	Improving 95
JMSPH	SDIN	0.9147	0.0000	No Trend	0.0009	-0.0008		Improving		0.0011	Different	0.0014	Improving 95
JMSPH	BDIN	0.1128	0.0000	No Trend	0.0011	-0.0007		Improving		0.0004	Different	0.0047	Improving 95
JMSPH	STP	0.5062	0.0002	No Trend	<0.0001	-0.0005		Improving		<0.0001	Different	<0.0001	Improving 95
JMSPH	BTP	0.4686	0.0005	No Trend	<0.0001	-0.0006		Improving		<0.0001	Different	<0.0001	Improving 95
JMSPH	SPO4F	0.2019	0.0000	No Trend	0.0182	-0.0001		No Trend		0.0523	Same	0.0088	Improving
JMSPH	BPO4F	0.6865	0.0000	No Trend	0.0027	-0.0001		Improving		0.0052	Different	0.0026	Improving 95
ELIPH	STN	0.3762	0.0048	No Trend	0.0002	-0.0057		Improving		0.0002	Different	0.0011	Improving 95
ELIPH	BTN	0.4951	0.0014	No Trend	0.0024	-0.0041		Improving		0.0018	Different	0.0064	Improving 95
ELIPH	SDIN	0.6306	0.0000	No Trend	0.0369	-0.0022		No Trend		0.0316	Same	0.0598	No Trend
ELIPH	BDIN	0.9368	0.0000	No Trend	0.0058	-0.0021		Improving		0.0068	Different	0.0080	Improving 95
ELIPH	STP	0.8184	0.0000	No Trend	0.0007	-0.0004		Improving		0.0009	Different	0.0014	Improving 95
ELIPH	BTP	0.1060	0.0013	No Trend	0.0015	-0.0005		Improving		0.0004	Different	0.0090	Improving 95
ELIPH	SPO4F	0.5337	0.0000	No Trend	0.1197	-0.0001		No Trend		0.0945	Same	0.1816	No Trend
ELIPH	BPO4F	0.3081	0.0000	No Trend	0.0575	-0.0001		No Trend		0.0351	Same	0.1186	No Trend
PMKTF	STN	0.9501	0.0006	No Trend	0.5198	-0.0007		No Trend		0.5206	Same	0.5575	No Trend
PMKTF	BTN	0.5995	-0.0050	No Trend	0.0014	-0.0063		Improving		0.0046	Different	0.0014	Improving 95
PMKTF	SDIN	0.6333	-0.0020	No Trend	0.1232	-0.0017		No Trend		0.1865	Same	0.1046	No Trend
PMKTF	BDIN	0.6427	0.0000	No Trend	0.0810	-0.0022		No Trend		0.1378	Same	0.0701	No Trend
PMKTF	STP	0.0005	0.0025	Degrading	0.2452	-0.0003		No Trend		0.0335	Same	0.9200	No Trend
PMKTF	BTP	<0.0001	0.0043	Degrading	0.0281	-0.0005		No Trend		0.0004	Different	0.5325	Degrading 85
PMKTF	SPO4F	0.0042	0.0000	High BDLS	<0.0001	-0.0006		Improving		<0.0001	Different	<0.0001	Improving 95
PMKTF	BPO4F	0.0041	0.0000	High BDLS	<0.0001	-0.0007		Improving		<0.0001	Different	<0.0001	Improving 95
PMKOH	STN	0.0002	0.0300	Degrading	0.2396	-0.0017		No Trend		0.0210	Same	0.9343	No Trend
PMKOH	BTN	0.0005	0.0508	Degrading	0.7874	0.0012		No Trend		0.3988	Same	0.1750	No Trend
PMKOH	SDIN	0.5889	0.0000	No Trend	0.8805	-0.0001		No Trend		0.9823	Same	0.7565	No Trend
PMKOH	BDIN	0.7455	0.0000	No Trend	0.9551	0.0001		No Trend		0.9654	Same	0.8793	No Trend
PMKOH	STP	0.0005	0.0063	Degrading	0.1865	-0.0005		No Trend		0.0176	Same	0.8946	No Trend
PMKOH	BTP	0.0003	0.0175	Degrading	0.6704	0.0004		No Trend		0.4734	Same	0.1267	No Trend
PMKOH	SPO4F	0.0116	0.0000	No Trend	0.0001	0.0003		Degrading		0.0027	Different	<0.0001	Degrading 95
PMKOH	BPO4F	0.1884	0.0000	No Trend	<0.0001	0.0003		Degrading		0.0004	Different	<0.0001	Degrading 95

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Segment	Parameter	'93		'93		'10		'10		Trend Comparison	Combined		
		P value	Slope	Direction	P value	Slope	Direction	P value	Comparison		Trend	P value	Direction
MPNTF	STN	0.9251	0.0004	No Trend	0.0735	0.0024	No Trend	0.0944	Same	0.0807	No Trend		
MPNTF	BTN	0.0293	-0.0108	No Trend	0.9464	-0.0001	No Trend	0.5237	Same	0.4441	No Trend		
MPNTF	SDIN	0.2760	0.0013	No Trend	0.0091	0.0025	Degrading	0.0285	Same	0.0048	Degrading		
MPNTF	BDIN	0.5042	0.0000	No Trend	0.0212	0.0020	No Trend	0.0474	Same	0.0160	No Trend		
MPNTF	STP	0.0002	0.0017	Degrading	0.5852	0.0001	No Trend	0.6002	Same	0.1159	No Trend		
MPNTF	BTP	0.0211	0.0013	No Trend	0.9303	0.0000	No Trend	0.4229	Same	0.5255	No Trend		
MPNTF	SPO4F	1.0000	0.0000	No Trend	<0.0001	-0.0005	Improving	<0.0001	Different	<0.0001	Improving 95		
MPNTF	BPO4F	0.0287	0.0000	No Trend	<0.0001	-0.0006	Improving	<0.0001	Different	<0.0001	Improving 95		
MPNOH	STN	<0.0001	0.0259	Degrading	0.2203	-0.0017	No Trend	0.0112	Same	0.8442	No Trend		
MPNOH	BTN	0.0145	0.0232	No Trend	0.0098	-0.0061	Improving	0.0013	Different	0.0913	Improving 95		
MPNOH	SDIN	0.2419	0.0011	No Trend	0.7701	0.0003	No Trend	0.9690	Same	0.5469	No Trend		
MPNOH	BDIN	0.2875	0.0020	No Trend	0.1752	0.0014	No Trend	0.3091	Same	0.1100	No Trend		
MPNOH	STP	<0.0001	0.0058	Degrading	0.3159	-0.0004	No Trend	0.0240	Same	0.7373	No Trend		
MPNOH	BTP	0.0012	0.0061	Degrading	0.5859	-0.0003	No Trend	0.1316	Same	0.6388	No Trend		
MPNOH	SPO4F	0.0603	0.0000	No Trend	0.5750	0.0000	No Trend	0.9568	Same	0.3030	No Trend		
MPNOH	BPO4F	0.0943	0.0000	No Trend	0.5726	0.0000	No Trend	0.9370	Same	0.3139	No Trend		
YRKMH	STN	0.0003	0.0225	Degrading	0.9749	-0.0002	No Trend	0.2367	Same	0.2612	No Trend		
YRKMH	BTN	<0.0001	0.0296	Degrading	0.5338	-0.0015	No Trend	0.0560	Same	0.4690	No Trend		
YRKMH	SDIN	0.7671	0.0000	No Trend	0.9381	0.0000	No Trend	0.8650	Same	0.9830	No Trend		
YRKMH	BDIN	0.2243	0.0000	No Trend	0.9029	-0.0001	No Trend	0.6674	Same	0.8467	No Trend		
YRKMH	STP	<0.0001	0.0050	Degrading	0.4127	0.0002	No Trend	0.2839	Same	0.0085	Degrading		
YRKMH	BTP	<0.0001	0.0075	Degrading	0.4585	0.0004	No Trend	0.4851	Same	0.0345	No Trend		
YRKMH	SPO4F	<0.0001	0.0008	Degrading	0.0028	0.0002	Degrading	0.0923	Same	<0.0001	Degrading		
YRKMH	BPO4F	<0.0001	0.0010	Degrading	<0.0001	0.0003	Degrading	0.0026	Different	<0.0001	Degrading*		
YRKPH	STN	0.0061	0.0135	Degrading	0.6310	-0.0007	No Trend	0.1842	Same	0.6772	No Trend		
YRKPH	BTN	<0.0001	0.0279	Degrading	0.0161	-0.0028	No Trend	0.0002	Different	0.3951	Degrading 85		
YRKPH	SDIN	0.7844	0.0000	No Trend	0.1461	-0.0003	No Trend	0.1756	Same	0.1362	No Trend		
YRKPH	BDIN	0.0124	0.0000	No Trend	0.0067	-0.0010	Improving	0.0017	Different	0.0287	Improving 95		
YRKPH	STP	<0.0001	0.0029	Degrading	0.4090	-0.0001	No Trend	0.0140	Same	0.3768	No Trend		
YRKPH	BTP	<0.0001	0.0036	Degrading	0.3311	-0.0003	No Trend	0.0076	Different	0.4167	Degrading 85		
YRKPH	SPO4F	0.0037	0.0000	High BDLS	0.3508	0.0001	No Trend	0.8766	Same	0.0990	No Trend		
YRKPH	BPO4F	0.0104	0.0000	No Trend	0.6883	0.0000	No Trend	0.8005	Same	0.3030	No Trend		
RPPTF	STN	0.4714	-0.0077	No Trend	<0.0001	-0.0080	Improving	<0.0001	Different	<0.0001	Improving 95		
RPPTF	BTN	0.0202	-0.0213	No Trend	<0.0001	-0.0093	Improving	<0.0001	Different	<0.0001	Improving 95		
RPPTF	SDIN	0.2397	0.0067	No Trend	0.2574	-0.0018	No Trend	0.1546	Same	0.4517	No Trend		
RPPTF	BDIN	0.0783	0.0100	No Trend	0.3749	-0.0015	No Trend	0.1790	Same	0.7165	No Trend		
RPPTF	STP	0.1001	0.0009	No Trend	<0.0001	-0.0009	Improving	<0.0001	Different	<0.0001	Improving 95		
RPPTF	BTP	0.3526	0.0007	No Trend	0.0004	-0.0009	Improving	0.0003	Different	0.0019	Improving 95		
RPPTF	SPO4F	0.6996	0.0000	No Trend	<0.0001	-0.0002	Improving	<0.0001	Different	<0.0001	Improving 95		
RPPTF	BPO4F	0.6793	0.0000	No Trend	<0.0001	-0.0002	Improving	<0.0001	Different	<0.0001	Improving 95		

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Segment	Parameter	'93		'93	'10		'10	Trend		Combined	
		Trend	Slope		Trend	Slope		Comparison	Trend	Trend	Combined Trend
		P value		Direction	P value		Direction	P value	Comparison	P value	Direction
RPPOH	STN	0.1402	0.0100	No Trend	0.7408	0.0005	No Trend	0.8965	Same	0.4460	No Trend
RPPOH	BTN	0.0018	0.0268	Degrading	0.6112	-0.0009	No Trend	0.1584	Same	0.6611	No Trend
RPPOH	SDIN	0.1570	0.0000	No Trend	0.6266	0.0000	No Trend	0.9525	Same	0.3820	No Trend
RPPOH	BDIN	0.0650	0.0000	No Trend	0.9747	0.0000	No Trend	0.5832	Same	0.6257	No Trend
RPPOH	STP	<0.0001	0.0050	Degrading	0.2967	-0.0002	No Trend	0.0280	Same	0.8377	No Trend
RPPOH	BTP	<0.0001	0.0070	Degrading	0.8626	-0.0001	No Trend	0.1230	Same	0.2253	No Trend
RPPOH	SPO4F	0.4570	0.0000	No Trend	0.0067	-0.0001	Improving	0.0115	Same	0.0049	Improving
RPPOH	BPO4F	0.1177	0.0000	No Trend	0.0006	-0.0002	Improving	0.0021	Different	0.0002	Improving 95
CRRMH	STN	0.1829	0.0020	No Trend	0.0088	-0.0026	Improving	0.0036	Different	0.0381	Improving 95
CRRMH	BTN	0.0345	0.0180	No Trend	<0.0001	-0.0085	Improving	<0.0001	Different	<0.0001	Improving 95
CRRMH	SDIN	0.1653	0.0000	No Trend	0.0036	-0.0001	Improving	0.0019	Different	0.0079	Improving 95
CRRMH	BDIN	0.5659	0.0000	No Trend	0.0627	-0.0002	No Trend	0.0527	Same	0.0808	No Trend
CRRMH	STP	<0.0001	0.0013	Degrading	0.0262	-0.0002	No Trend	0.0004	Different	0.4695	Degrading 85
CRRMH	BTP	<0.0001	0.0017	Degrading	<0.0001	-0.0009	Improving	<0.0001	Different	<0.0001	D85 - I95
CRRMH	SPO4F	0.6865	0.0000	No Trend	0.0008	0.0000	Improving	0.0007	Different	0.0011	Improving 95
CRRMH	BPO4F	0.2846	0.0000	No Trend	<0.0001	-0.0001	Improving	0.0002	Different	<0.0001	Improving 95
RPPMH	STN	0.0018	0.0133	Degrading	0.0159	-0.0024	No Trend	0.0014	Different	0.1531	Degrading 85
RPPMH	BTN	0.0018	0.0158	Degrading	<0.0001	-0.0059	Improving	<0.0001	Different	<0.0001	D85 - I95
RPPMH	SDIN	0.3587	0.0000	No Trend	0.0449	-0.0002	No Trend	0.0805	Same	0.0302	No Trend
RPPMH	BDIN	0.9137	0.0000	No Trend	0.0575	-0.0008	No Trend	0.0704	Same	0.0603	No Trend
RPPMH	STP	<0.0001	0.0020	Degrading	0.0233	-0.0003	No Trend	0.0004	Different	0.4035	Degrading 85
RPPMH	BTP	0.0034	0.0017	Degrading	<0.0001	-0.0007	Improving	<0.0001	Different	0.0007	D85 - I95
RPPMH	SPO4F	0.8505	0.0000	No Trend	0.0018	-0.0001	Improving	0.0023	Different	0.0018	Improving 95
RPPMH	BPO4F	0.1772	0.0000	No Trend	0.0021	-0.0001	Improving	0.0011	Different	0.0048	Improving 95
MOBPH	STSS	0.0010	0.5000	Degrading	<0.0001	-0.1500	Improving	<0.0001	Different	0.0031	D85 - I95
MOBPH	BTSS	0.0384	0.4286	No Trend	<0.0001	-0.3674	Improving	<0.0001	Different	<0.0001	Improving 95
PIAMH	STSS	0.0010	0.3750	Degrading	<0.0001	-0.1113	Improving	<0.0001	Different	0.0028	D85 - I95
PIAMH	BTSS	0.8028	0.0000	No Trend	<0.0001	-0.2600	Improving	<0.0001	Different	<0.0001	Improving 95
POCMH	STSS	<0.0001	1.3452	Degrading	<0.0001	-0.3542	Improving	<0.0001	Different	0.0933	D85 - I95
POCMH	BTSS	<0.0001	1.1156	Degrading	<0.0001	-0.5652	Improving	<0.0001	Different	0.0051	D85 - I95
CB5MH	STSS	0.0253	0.1950	No Trend	<0.0001	-0.1124	Improving	<0.0001	Different	<0.0001	Improving 95
CB5MH	BTSS	0.0011	0.6250	Degrading	<0.0001	-0.4186	Improving	<0.0001	Different	<0.0001	D85 - I95
CB6PH	STSS	0.0308	0.2500	No Trend	<0.0001	-0.1463	Improving	<0.0001	Different	<0.0001	Improving 95
CB6PH	BTSS	0.1155	0.3000	No Trend	<0.0001	-0.4802	Improving	<0.0001	Different	<0.0001	Improving 95
CB7PH	STSS	<0.0001	0.3700	Degrading	<0.0001	-0.0800	Improving	<0.0001	Different	0.0450	D85 - I95
CB7PH	BTSS	0.0009	0.7850	Degrading	<0.0001	-0.3885	Improving	<0.0001	Different	<0.0001	D85 - I95

Appendix A - Section II. Seasonal Kendall long-term trends in water quality for all tributaries and the Virginia Mainstem Chesapeake Bay (1985-2015). Parameters are as follows: STN=Surface total nitrogen, BTN=Bottom total nitrogen, SDIN=Surface dissolved inorganic nitrogen, BDIN=Bottom dissolved inorganic nitrogen, STP=Surface total phosphorus, BTP=Bottom total phosphorus, SPO4F=Surface dissolved inorganic phosphorus, BPO4F=Bottom dissolved inorganic phosphorus, SCHLA=Surface chlorophyll *a*, STSS=Surface total suspended solids, BTSS=Bottom total suspended solids, SECCHI=Secchi depth, SDO=Surface dissolved oxygen, BDO=Bottom dissolved oxygen, SSALINITY=Surface salinity, BSALINITY=Bottom salinity, SWTEMP= Surface water temperature, BWTEMP=Bottom water temperature.

Segment	Parameter	% BDLs	P value	Slope	Absolute			Direction	Homogeneity	
					Baseline	Change	% Change		Trend test	P value
APPTF	SCHLA	2.25	0.0573	-0.05	30.94	-1.55	-5.01	No Trend		0.3729
APPTF	STSS	0.00	0.0004	-0.20	19.50	-5.60	-28.72	Improving		0.8664
APPTF	BTSS	0.00	0.0678	-0.18	27.25	-5.09	-18.68	No Trend		0.9135
APPTF	SECCHI	0.00	0.0042	0.00	0.50	0.00	0.00	Unchanged		0.4423
APPTF	SDO	0.00	0.0493	0.01	9.30	0.43	4.62	No Trend		0.6884
APPTF	BDO	0.00	0.0370	0.01	8.95	0.41	4.58	No Trend		0.5017
APPTF	SSALINITY	0.00	0.2654	0.00	0.01	0.00	0.00	No Trend		0.9053
APPTF	BSALINITY	0.00	0.1755	0.00	0.01	0.00	0.00	No Trend		0.9420
APPTF	SWTEMP	0.00	0.0099	0.04	19.68	1.10	5.60	Increasing		0.7815
APPTF	BWTEMP	0.00	0.0210	0.04	19.00	1.09	5.76	No Trend		0.4321
JMSTF1	SCHLA	3.94	<0.0001	-0.05	3.80	-1.54	-40.50	Improving		0.0993
JMSTF1	STSS	1.56	0.0179	-0.05	9.00	-1.40	-15.56	No Trend		0.7702
JMSTF1	BTSS	0.47	0.6031	0.00	16.25	0.00	0.00	No Trend		0.3393
JMSTF1	SECCHI	0.00	0.7695	0.00	1.00	0.00	0.00	No Trend		0.7873
JMSTF1	SDO	0.00	0.0578	-0.01	8.75	-0.28	-3.25	No Trend		0.9505
JMSTF1	BDO	0.00	0.6029	0.00	7.75	-0.09	-1.21	No Trend		0.4996
JMSTF1	SSALINITY	0.00	0.0719	0.00	0.01	0.00	0.00	No Trend		0.7988
JMSTF1	BSALINITY	0.00	0.0736	0.00	0.01	0.00	0.00	No Trend		0.9830
JMSTF1	SWTEMP	0.00	0.6264	0.01	18.78	0.26	1.36	No Trend		0.5576
JMSTF1	BWTEMP	0.00	0.1255	0.02	19.00	0.75	3.92	No Trend		0.3596
JMSTF2	SCHLA	0.73	0.2420	-0.05	16.56	-1.41	-8.52	No Trend		0.4946
JMSTF2	STSS	0.02	0.0185	-0.13	19.75	-3.50	-17.72	No Trend		0.4011
JMSTF2	BTSS	0.03	0.2394	0.21	172.00	6.53	3.79	No Trend		0.8561
JMSTF2	SECCHI	0.00	<0.0001	0.00	0.60	-0.07	-11.74	Degrading		0.3265
JMSTF2	SDO	0.00	0.0092	0.02	8.15	0.48	5.85	Improving		0.5404
JMSTF2	BDO	0.00	0.0074	0.02	7.83	0.50	6.44	Improving		0.6911
JMSTF2	SSALINITY	0.00	<0.0001	0.00	0.01	0.00	0.00	Unchanged		0.3962
JMSTF2	BSALINITY	0.00	<0.0001	0.00	0.01	0.00	0.00	Unchanged		0.6257
JMSTF2	SWTEMP	0.00	0.0821	0.02	18.50	0.70	3.77	No Trend		0.7457
JMSTF2	BWTEMP	0.00	0.1223	0.02	18.35	0.62	3.38	No Trend		0.6236
CHKOH	SCHLA	0.99	<0.0001	-0.22	22.35	-6.08	-27.19	Improving		0.7019
CHKOH	STSS	0.00	0.1811	0.10	17.50	2.67	15.24	No Trend		0.2929
CHKOH	BTSS	0.00	0.0049	0.40	27.00	11.20	41.48	Degrading		0.9219
CHKOH	SECCHI	0.00	<0.0001	-0.01	0.60	-0.22	-35.90	Degrading		0.7572
CHKOH	SDO	0.00	0.2717	0.01	8.83	0.19	2.12	No Trend		0.0435
CHKOH	BDO	0.00	0.1267	0.01	8.88	0.32	3.55	No Trend		0.0250
CHKOH	SSALINITY	0.00	<0.0001	0.00	0.01	0.00	0.00	Unchanged		0.9854
CHKOH	BSALINITY	0.00	<0.0001	0.00	0.01	0.00	0.00	Unchanged		0.9793
CHKOH	SWTEMP	0.00	0.1389	0.02	16.00	0.67	4.17	No Trend		0.2108
CHKOH	BWTEMP	0.00	0.0998	0.03	15.60	0.70	4.49	No Trend		0.2053
JMSOH	SCHLA	0.69	0.0253	-0.06	7.22	-1.72	-23.89	No Trend		0.2489
JMSOH	STSS	0.06	0.2884	-0.10	662.00	-2.95	-0.45	No Trend		0.6525
JMSOH	BTSS	0.00	0.8016	-0.08	290.00	-2.48	-0.86	No Trend		0.2777

Appendix A - Section II (continued). Seasonal Kendall long-term trends in water quality for all tributaries and the Virginia Mainstem Chesapeake Bay (1985-2015). Parameters are as follows: STN=Surface total nitrogen, BTN=Bottom total nitrogen, SDIN=Surface dissolved inorganic nitrogen, BDIN=Bottom dissolved inorganic nitrogen, STP=Surface total phosphorus, BTP=Bottom total phosphorus, SPO4F=Surface dissolved inorganic phosphorus, BPO4F=Bottom dissolved inorganic phosphorus, SCHLA=Surface chlorophyll *a*, STSS=Surface total suspended solids, BTSS=Bottom total suspended solids, SECCHI=Secchi depth, SDO=Surface dissolved oxygen, BDO=Bottom dissolved oxygen, SSALINITY=Surface salinity, BSALINITY=Bottom salinity, SWTEMP= Surface water temperature, BWTEMP=Bottom water temperature.

Segment	Parameter	% BDLs	P value	Slope	Absolute			Direction	Homogeneity	
					Baseline	Change	% Change		Trend test	P value
JMSOH	SECCHI	0.00	0.3182	0.00	0.53	0.00	0.00	No Trend		0.2507
JMSOH	SDO	0.00	0.4446	0.00	8.60	0.12	1.39	No Trend		0.4497
JMSOH	BDO	0.00	0.5177	0.00	8.08	-0.09	-1.07	No Trend		0.7026
JMSOH	SSALINITY	0.00	0.0016	0.02	2.72	0.71	26.31	Increasing		0.7052
JMSOH	BSALINITY	0.00	0.0002	0.04	3.47	1.31	37.84	Increasing		0.7055
JMSOH	SWTEMP	0.00	0.5250	0.01	18.30	0.24	1.33	No Trend		0.8794
JMSOH	BWTEMP	0.00	0.4712	0.01	18.48	0.31	1.68	No Trend		0.7496
JMSMH	SCHLA	0.90	0.0478	0.03	4.47	1.00	22.44	No Trend		0.0085
JMSMH	STSS	0.21	0.6638	0.00	15.00	0.00	0.00	No Trend		0.8084
JMSMH	BTSS	0.10	0.0025	0.25	142.00	7.75	5.46	Degrading		0.7544
JMSMH	SECCHI	0.00	0.1169	0.00	0.95	0.00	0.00	No Trend		0.7270
JMSMH	SDO	0.00	0.0063	0.01	7.55	0.36	4.82	Improving		0.6036
JMSMH	BDO	0.00	0.5727	0.00	7.50	0.08	1.08	No Trend		0.7880
JMSMH	SSALINITY	0.00	0.3750	0.02	14.96	0.66	4.38	No Trend		0.5966
JMSMH	BSALINITY	0.00	0.9451	0.00	18.35	-0.01	-0.06	No Trend		0.5760
JMSMH	SWTEMP	0.00	0.8119	0.00	20.13	0.06	0.30	No Trend		0.8652
JMSMH	BWTEMP	0.00	0.9958	0.00	19.90	0.00	0.00	No Trend		0.9211
JMSPH	SCHLA	0.29	0.0015	0.06	8.19	1.87	22.81	Degrading		<0.0001
JMSPH	STSS	0.15	0.1901	0.03	8.25	0.86	10.44	No Trend		0.9629
JMSPH	BTSS	0.03	<0.0001	-0.22	18.45	-6.74	-36.51	Improving		0.0725
JMSPH	SECCHI	0.00	<0.0001	-0.01	1.30	-0.24	-18.83	Degrading		0.0518
JMSPH	SDO	0.00	0.0180	0.01	8.10	0.33	4.12	No Trend		0.2021
JMSPH	BDO	0.00	<0.0001	0.03	7.63	0.99	12.96	Improving		0.8493
JMSPH	SSALINITY	0.00	0.1072	-0.03	21.56	-0.80	-3.71	No Trend		0.9456
JMSPH	BSALINITY	0.00	<0.0001	-0.12	24.83	-3.67	-14.76	Decreasing		0.2718
JMSPH	SWTEMP	0.00	0.4480	0.01	17.40	0.17	1.00	No Trend		0.9482
JMSPH	BWTEMP	0.00	0.0001	0.04	16.95	1.09	6.40	Increasing		0.2420
EBEMH	STN	0.34	<0.0001	-0.01	1.04	-0.34	-32.88	Improving		0.5135
WBEMH	STN	0.00	<0.0001	-0.01	0.80	-0.18	-22.18	Improving		0.3986
SBEMH	STN	0.17	<0.0001	-0.02	1.33	-0.54	-40.74	Improving		0.9470
EBEMH	BTN	0.00	<0.0001	-0.01	0.86	-0.31	-36.23	Improving		0.8144
WBEMH	BTN	0.00	<0.0001	-0.01	0.79	-0.21	-26.17	Improving		0.1585
SBEMH	BTN	0.00	<0.0001	-0.01	1.07	-0.38	-35.80	Improving		0.7940
EBEMH	SDIN	0.33	<0.0001	-0.01	0.51	-0.22	-42.43	Improving		0.9903
SBEMH	SDIN	0.00	<0.0001	-0.02	0.74	-0.43	-57.76	Improving		0.8311
EBEMH	BDIN	0.00	<0.0001	-0.01	0.49	-0.20	-39.91	Improving		0.9975
SBEMH	BDIN	0.17	<0.0001	-0.01	0.59	-0.27	-46.35	Improving		0.9317
EBEMH	STP	0.00	<0.0001	0.00	0.07	-0.02	-27.54	Improving		0.0983
WBEMH	STP	0.00	<0.0001	0.00	0.08	-0.02	-25.35	Improving		0.4387
SBEMH	STP	0.00	<0.0001	0.00	0.07	-0.02	-27.78	Improving		0.0644
EBEMH	BTP	0.00	<0.0001	0.00	0.07	-0.03	-36.49	Improving		0.7491

Appendix A - Section II (continued). Seasonal Kendall long-term trends in water quality for all tributaries and the Virginia Mainstem Chesapeake Bay (1985-2015). Parameters are as follows: STN=Surface total nitrogen, BTN=Bottom total nitrogen, SDIN=Surface dissolved inorganic nitrogen, BDIN=Bottom dissolved inorganic nitrogen, STP=Surface total phosphorus, BTP=Bottom total phosphorus, SPO4F=Surface dissolved inorganic phosphorus, BPO4F=Bottom dissolved inorganic phosphorus, SCHLA=Surface chlorophyll *a*, STSS=Surface total suspended solids, BTSS=Bottom total suspended solids, SECCHI=Secchi depth, SDO=Surface dissolved oxygen, BDO=Bottom dissolved oxygen, SSALINITY=Surface salinity, BSALINITY=Bottom salinity, SWTEMP= Surface water temperature, BWTEMP=Bottom water temperature.

Segment	Parameter	% BDLs	P value	Slope	Absolute			Direction	Homogeneity	
					Baseline	Change	% Change		Trend test	P value
WBEMH	BTP	0.00	<0.0001	0.00	0.08	-0.02	-29.78	Improving		0.3927
SBEMH	BTP	0.00	<0.0001	0.00	0.08	-0.03	-35.86	Improving		0.3904
EBEMH	SPO4F	12.38	0.0092	0.00	0.04	0.00	-6.21	Improving		0.3263
SBEMH	SPO4F	4.82	0.0055	0.00	0.05	-0.01	-13.08	Improving		0.4927
EBEMH	BPO4F	12.99	0.0002	0.00	0.05	0.00	-6.92	Improving		0.5189
WBEMH	BPO4F	18.51	0.0091	0.00	0.03			Improving		0.0289
SBEMH	BPO4F	7.07	<0.0001	0.00	0.05	-0.01	-19.08	Improving		0.7097
WBEMH	SCHLA	3.62	<0.0001	-0.23	23.00	-6.20	-26.95	Improving		0.4817
EBEMH	STSS	0.65	0.0006	-0.12	9.95	-3.30	-33.18	Improving		0.9544
WBEMH	STSS	0.00	0.0030	-0.18	20.60	-4.95	-24.03	Improving		0.6608
SBEMH	STSS	1.46	0.0003	-0.10	8.58	-2.77	-32.27	Improving		0.5285
EBEMH	BTSS	0.65	<0.0001	-0.28	12.15	-7.56	-62.22	Improving		0.9486
WBEMH	BTSS	0.00	<0.0001	-0.35	20.50	-9.39	-45.78	Improving		0.5817
SBEMH	BTSS	0.33	<0.0001	-0.25	13.08	-6.75	-51.63	Improving		0.8320
EBEMH	SECCHI	0.00	<0.0001	0.01	1.00	0.26	25.71	Improving		0.2837
WBEMH	SECCHI	0.00	0.0008	0.00	0.60	0.00	0.00	Unchanged		0.8758
SBEMH	SECCHI	0.00	0.0010	0.01	0.75	0.19	25.71	Improving		0.2809
SBEMH	BDO	0.00	0.0117	0.02	5.25	0.58	10.99	No Trend		0.3896
WBEMH	SDIN	2.36	0.0511	0.00	0.20	-0.02	-8.38	No Trend		0.3978
WBEMH	BDIN	1.70	0.0100	0.00	0.26	-0.05	-19.57	Improving		0.5288
WBEMH	SPO4F	20.20	0.1133	0.00	0.03			No Trend		0.0121
EBEMH	SCHLA	18.63	0.0285	-0.01	6.60			No Trend		0.2425
SBEMH	SCHLA	28.41	0.0507	0.00	4.05			No Trend		0.7774
EBEMH	SDO	0.00	0.9234	0.00	6.40	0.00	0.00	No Trend		0.8380
WBEMH	SDO	0.00	0.1199	-0.02	7.10	-0.40	-5.70	No Trend		0.8204
SBEMH	SDO	0.00	0.7814	0.00	6.08	0.03	0.56	No Trend		0.5252
EBEMH	BDO	0.00	0.3091	0.01	6.10	0.18	2.88	No Trend		0.5600
WBEMH	BDO	0.00	0.9113	0.00	6.90	-0.01	-0.16	No Trend		0.3173
EBEMH	SSALINITY	0.00	0.1360	0.03	16.85	0.85	5.07	No Trend		0.4585
WBEMH	SSALINITY	0.00	0.1463	0.03	15.90	0.80	5.02	No Trend		0.9384
SBEMH	SSALINITY	0.00	0.1032	0.04	14.75	1.04	7.02	No Trend		0.8966
EBEMH	BSALINITY	0.00	0.3222	0.02	18.40	0.58	3.16	No Trend		0.9176
WBEMH	BSALINITY	0.00	0.2196	0.02	16.70	0.66	3.93	No Trend		0.8008
SBEMH	BSALINITY	0.00	0.7042	0.01	18.45	0.17	0.90	No Trend		0.9746
EBEMH	SWTEMP	0.00	0.0841	0.02	17.00	0.65	3.81	No Trend		0.6981
WBEMH	SWTEMP	0.00	0.1005	0.02	17.00	0.60	3.55	No Trend		0.8507
SBEMH	SWTEMP	0.00	0.8048	0.00	18.20	-0.12	-0.64	No Trend		0.5446
EBEMH	BWTEMP	0.00	0.0615	0.03	15.90	0.71	4.50	No Trend		0.9404
WBEMH	BWTEMP	0.00	0.0298	0.03	16.15	0.78	4.81	No Trend		0.8721
SBEMH	BWTEMP	0.00	0.0240	0.04	17.10	0.97	5.66	No Trend		0.9203

Appendix A - Section II (continued). Seasonal Kendall long-term trends in water quality for all tributaries and the Virginia Mainstem Chesapeake Bay (1985-2015). Parameters are as follows: STN=Surface total nitrogen, BTN=Bottom total nitrogen, SDIN=Surface dissolved inorganic nitrogen, BDIN=Bottom dissolved inorganic nitrogen, STP=Surface total phosphorus, BTP=Bottom total phosphorus, SPO4F=Surface dissolved inorganic phosphorus, BPO4F=Bottom dissolved inorganic phosphorus, SCHLA=Surface chlorophyll *a*, STSS=Surface total suspended solids, BTSS=Bottom total suspended solids, SECCHI=Secchi depth, SDO=Surface dissolved oxygen, BDO=Bottom dissolved oxygen, SSALINITY=Surface salinity, BSALINITY=Bottom salinity, SWTEMP= Surface water temperature, BWTEMP=Bottom water temperature.

Segment	Parameter	% BDLs	P value	Slope	Absolute			Direction	Homogeneity	
					Baseline	Change	% Change		Trend test	P value
ELIPH	SCHLA	0.50	0.7634	0.01	8.63	0.18	2.13	No Trend		<0.0001
ELIPH	STSS	0.23	0.7963	-0.01	8.00	-0.26	-3.26	No Trend		0.8869
ELIPH	BTSS	0.02	0.6355	0.04	16.00	1.22	7.62	No Trend		0.5346
ELIPH	SECCHI	0.00	0.0184	0.00	1.10	-0.08	-7.42	No Trend		0.2190
ELIPH	SDO	0.00	0.0005	0.02	7.30	0.59	8.02	Impr		0.1919
ELIPH	BDO	0.00	0.3486	0.00	6.70	0.15	2.22	No Trend		0.5370
ELIPH	SSALINITY	0.00	0.0224	-0.04	21.01	-1.29	-6.12	No Trend		0.9941
ELIPH	BSALINITY	0.00	0.0500	-0.03	24.39	-0.93	-3.81	No Trend		0.8584
ELIPH	SWTEMP	0.00	0.2199	0.01	20.00	0.33	1.67	No Trend		0.7447
ELIPH	BWTEMP	0.00	0.7744	0.00	17.90	0.12	0.67	No Trend		0.9701
PMKTF	SCHLA	6.93	0.1776	-0.01	3.10	-0.28	-8.90	No Trend		0.2679
PMKTF	STSS	0.23	<0.0001	0.30	14.00	8.40	60.00	Degrading		0.4478
PMKTF	BTSS	0.17	0.2301	0.12	20.50	3.23	15.76	No Trend		0.3956
PMKTF	SECCHI	0.00	<0.0001	-0.01	0.70	-0.22	-31.63	Degrading		0.2128
PMKTF	SDO	0.00	0.0362	0.01	7.00	0.37	5.35	No Trend		0.0257
PMKTF	BDO	0.00	0.0217	0.02	6.83	0.47	6.81	No Trend		0.1243
PMKTF	SSALINITY	0.00	<0.0001	0.00	0.01	0.00	0.00	Unchanged		0.3579
PMKTF	BSALINITY	0.00	<0.0001	0.00	0.01	0.00	0.00	Unchanged		0.4251
PMKTF	SWTEMP	0.00	0.0092	0.04	18.00	1.16	6.46	Increasing		0.8386
PMKTF	BWTEMP	0.00	0.0176	0.04	19.10	1.11	5.84	No Trend		0.9756
PMKOH	SCHLA	2.45	0.1021	0.03	6.38	0.89	13.92	No Trend		0.7541
PMKOH	STSS	0.07	0.0023	-0.47	48.00	-14.68	-30.59	Improving		0.8237
PMKOH	BTSS	0.09	0.6099	-0.38	102.00	-10.63	-10.43	No Trend		0.8600
PMKOH	SECCHI	0.00	0.0006	0.00	0.30	0.00	0.00	Unchanged		0.8424
PMKOH	SDO	0.00	0.5091	0.00	6.25	-0.10	-1.63	No Trend		0.8748
PMKOH	BDO	0.00	0.3952	0.00	6.15	-0.14	-2.29	No Trend		0.8548
PMKOH	SSALINITY	0.00	0.0101	0.03	3.49	0.82	23.38	No Trend		0.9869
PMKOH	BSALINITY	0.00	0.0133	0.03	4.31	0.97	22.43	No Trend		0.9755
PMKOH	SWTEMP	0.00	0.0717	0.02	20.55	0.65	3.17	No Trend		0.6093
PMKOH	BWTEMP	0.00	0.0441	0.02	20.70	0.70	3.38	No Trend		0.5558
MPNTF	SCHLA	10.15	<0.0001	-0.04	3.10	-1.19	-38.46	Improving		0.3499
MPNTF	STSS	2.66	0.0089	0.08	6.50	2.33	35.90	Degrading		0.0003
MPNTF	BTSS	1.43	0.0532	0.06	8.25	1.67	20.27	No Trend		0.0017
MPNTF	SECCHI	0.00	<0.0001	-0.01	1.00	-0.34	-34.44	Degrading		0.0376
MPNTF	SDO	0.00	0.1442	-0.01	6.95	-0.26	-3.72	No Trend		0.2090
MPNTF	BDO	0.00	0.5672	0.00	6.98	-0.08	-1.21	No Trend		0.1978
MPNTF	SSALINITY	0.00	0.0124	0.00	0.01	0.00	0.00	No Trend		0.9535
MPNTF	BSALINITY	0.00	0.0231	0.00	0.01	0.00	0.00	No Trend		0.9661
MPNTF	SWTEMP	0.00	0.0028	0.04	17.50	1.37	7.82	Increasing		0.7564
MPNTF	BWTEMP	0.00	0.0041	0.05	18.58	1.41	7.60	Increasing		0.5791
MPNOH	SCHLA	4.06	0.8233	0.00	4.25	0.00	0.00	No Trend		0.7957

Appendix A - Section II (continued). Seasonal Kendall long-term trends in water quality for all tributaries and the Virginia Mainstem Chesapeake Bay (1985-2015). Parameters are as follows: STN=Surface total nitrogen, BTN=Bottom total nitrogen, SDIN=Surface dissolved inorganic nitrogen, BDIN=Bottom dissolved inorganic nitrogen, STP=Surface total phosphorus, BTP=Bottom total phosphorus, SPO4F=Surface dissolved inorganic phosphorus, BPO4F=Bottom dissolved inorganic phosphorus, SCHLA=Surface chlorophyll *a*, STSS=Surface total suspended solids, BTSS=Bottom total suspended solids, SECCHI=Secchi depth, SDO=Surface dissolved oxygen, BDO=Bottom dissolved oxygen, SSALINITY=Surface salinity, BSALINITY=Bottom salinity, SWTEMP= Surface water temperature, BWTEMP=Bottom water temperature.

Segment	Parameter	% BDLs	P value	Slope	Absolute			Direction	Homogeneity	
					Baseline	Change	% Change		Trend test	P value
MPNOH	STSS	0.13	0.1217	0.15	26.00	4.77	18.34	No Trend		0.1325
MPNOH	BTSS	0.08	0.1595	0.31	44.00	9.47	21.53	No Trend		0.1979
MPNOH	SECCHI	0.00	0.2053	0.00	0.48	0.00	0.00	No Trend		0.3885
MPNOH	SDO	0.00	0.5635	0.00	6.30	0.10	1.56	No Trend		0.6445
MPNOH	BDO	0.00	0.6994	0.00	6.08	0.00	0.00	No Trend		0.6567
MPNOH	SSALINITY	0.00	<0.0001	0.08	3.38	2.46	72.76	Increasing		0.9880
MPNOH	BSALINITY	0.00	<0.0001	0.08	4.31	2.50	57.95	Increasing		0.9941
MPNOH	SWTEMP	0.00	0.0054	0.03	20.50	0.93	4.54	Increasing		0.4200
MPNOH	BWTEMP	0.00	0.0095	0.03	20.33	0.95	4.67	Increasing		0.6972
YRKMH	SCHLA	0.39	0.0006	0.11	9.59	3.56	37.13	Degrading		0.3696
YRKMH	STSS	0.00	0.6098	0.03	27.00	0.88	3.24	No Trend		0.9679
YRKMH	BTSS	0.06	0.0013	0.67	39.00	18.67	47.86	Degrading		0.7460
YRKMH	SECCHI	0.00	0.5702	0.00	0.60	0.00	0.00	No Trend		0.2925
YRKMH	SDO	0.00	0.0082	0.01	6.68	0.38	5.64	Improving		0.9401
YRKMH	BDO	0.00	0.9341	0.00	6.30	0.00	0.00	No Trend		0.9137
YRKMH	SSALINITY	0.00	0.5841	-0.01	12.43	-0.39	-3.12	No Trend		0.9769
YRKMH	BSALINITY	0.00	0.4273	-0.01	13.58	-0.43	-3.18	No Trend		0.9875
YRKMH	SWTEMP	0.00	0.0709	0.02	20.05	0.64	3.19	No Trend		0.6246
YRKMH	BWTEMP	0.00	0.0287	0.03	19.90	0.83	4.17	No Trend		0.7719
YRKPH	SCHLA	0.37	0.0104	0.05	8.00	1.70	21.28	No Trend		0.0002
YRKPH	STSS	0.64	<0.0001	0.19	6.00	5.96	99.36	Degrading		0.6607
YRKPH	BTSS	0.14	<0.0001	0.53	17.75	14.82	83.51	Degrading		0.9020
YRKPH	SECCHI	0.00	0.0002	-0.01	1.20	-0.19	-16.15	Degrading		0.5363
YRKPH	SDO	0.00	0.0481	0.01	7.20	0.35	4.83	No Trend		0.8185
YRKPH	BDO	0.00	0.4345	0.01	6.88	0.19	2.82	No Trend		0.6800
YRKPH	SSALINITY	0.00	0.0004	-0.06	20.65	-1.72	-8.34	Decreasing		0.9928
YRKPH	BSALINITY	0.00	0.0002	-0.06	21.84	-1.72	-7.89	Decreasing		0.9325
YRKPH	SWTEMP	0.00	0.1421	0.02	19.03	0.66	3.46	No Trend		0.6091
YRKPH	BWTEMP	0.00	0.1176	0.02	18.73	0.60	3.18	No Trend		0.5938
MOBPH	SCHLA	0.62	0.6793	-0.01	5.62	-0.18	-3.28	No Trend		0.3776
MOBPH	SECCHI	0.00	<0.0001	-0.01	1.45	-0.27	-18.86	Degrading		0.7656
MOBPH	SDO	0.00	<0.0001	0.02	7.98	0.67	8.37	Improving		0.6145
MOBPH	BDO	0.00	<0.0001	0.03	7.68	0.80	10.46	Improving		0.4455
MOBPH	SSALINITY	0.00	0.0198	-0.03	22.22	-0.90	-4.06	No Trend		0.9968
MOBPH	BSALINITY	0.00	0.0012	-0.04	22.89	-1.13	-4.93	Decreasing		0.9826
MOBPH	SWTEMP	0.00	0.0209	0.02	18.45	0.73	3.94	No Trend		0.4622
MOBPH	BWTEMP	0.00	0.0110	0.02	17.63	0.76	4.31	No Trend		0.1591
RPPTF	SCHLA	1.59	0.1144	-0.04	12.39	-1.20	-9.73	No Trend		0.6308
RPPTF	STSS	0.09	<0.0001	-0.25	24.75	-7.00	-28.28	Improving		0.4055
RPPTF	BTSS	0.09	0.0076	-0.28	36.75	-7.81	-21.25	Improving		0.9706

Appendix A - Section II (continued). Seasonal Kendall long-term trends in water quality for all tributaries and the Virginia Mainstem Chesapeake Bay (1985-2015). Parameters are as follows: STN=Surface total nitrogen, BTN=Bottom total nitrogen, SDIN=Surface dissolved inorganic nitrogen, BDIN=Bottom dissolved inorganic nitrogen, STP=Surface total phosphorus, BTP=Bottom total phosphorus, SPO4F=Surface dissolved inorganic phosphorus, BPO4F=Bottom dissolved inorganic phosphorus, SCHLA=Surface chlorophyll *a*, STSS=Surface total suspended solids, BTSS=Bottom total suspended solids, SECCHI=Secchi depth, SDO=Surface dissolved oxygen, BDO=Bottom dissolved oxygen, SSALINITY=Surface salinity, BSALINITY=Bottom salinity, SWTEMP= Surface water temperature, BWTEMP=Bottom water temperature.

Segment	Parameter	% BDLs	P value	Slope	Absolute			Homogeneity	
					Baseline	Change	% Change	Direction	Trend test P value
RPPTF	SECCHI	0.00	0.0103	0.00	0.50	0.00	0.00	No Trend	0.9294
RPPTF	SDO	0.00	0.1727	-0.01	8.88	-0.22	-2.50	No Trend	0.0127
RPPTF	BDO	0.00	0.0382	-0.01	8.60	-0.39	-4.54	No Trend	0.0010
RPPTF	SSALINITY	0.00	<0.0001	0.00	0.01	0.03	310.00	Increasing	0.8172
RPPTF	BSALINITY	0.00	<0.0001	0.00	0.01	0.03	310.00	Increasing	0.6395
RPPTF	SWTEMP	0.00	0.0864	0.02	16.33	0.71	4.35	No Trend	0.4100
RPPTF	BWTEMP	0.00	0.0399	0.03	17.75	0.77	4.37	No Trend	0.3317
RPPOH	SCHLA	1.85	<0.0001	0.17	5.04	5.40	107.17	Degrading	0.1334
RPPOH	STSS	0.00	0.9050	0.00	31.50	0.00	0.00	No Trend	0.1926
RPPOH	BTSS	0.08	0.0676	0.35	38.00	9.84	25.90	No Trend	0.1702
RPPOH	SECCHI	0.00	<0.0001	0.00	0.40	-0.10	-24.22	Degrading	0.0273
RPPOH	SDO	0.00	<0.0001	0.02	8.63	0.74	8.56	Improving	0.0121
RPPOH	BDO	0.00	0.2137	0.01	8.65	0.21	2.45	No Trend	0.5626
RPPOH	SSALINITY	0.00	0.6100	0.00	2.17	0.00	0.00	No Trend	0.9859
RPPOH	BSALINITY	0.00	0.9372	0.00	2.59	0.00	0.00	No Trend	0.9743
RPPOH	SWTEMP	0.00	0.0092	0.03	16.00	1.03	6.46	Increasing	0.5088
RPPOH	BWTEMP	0.00	0.0718	0.02	16.40	0.67	4.10	No Trend	0.7800
RPPMH	SCHLA	0.13	<0.0001	0.09	8.33	2.76	33.14	Degrading	0.0574
RPPMH	STSS	0.31	0.2531	0.03	6.75	0.86	12.76	No Trend	0.7176
RPPMH	BTSS	0.10	0.0913	0.09	10.75	2.69	24.99	No Trend	0.7287
RPPMH	SECCHI	0.00	0.0009	-0.01	1.28	-0.19	-15.20	Degrading	0.0459
RPPMH	SDO	0.00	<0.0001	0.03	8.20	0.85	10.31	Improving	0.2023
RPPMH	BDO	0.00	0.8232	0.00	7.15	0.03	0.43	No Trend	0.1507
RPPMH	SSALINITY	0.00	0.0012	-0.06	15.30	-1.80	-11.76	Decreasing	0.9995
RPPMH	BSALINITY	0.00	0.0026	-0.04	17.02	-1.32	-7.78	Decreasing	0.9874
RPPMH	SWTEMP	0.00	0.0279	0.02	17.90	0.66	3.71	No Trend	0.7721
RPPMH	BWTEMP	0.00	0.1866	0.01	16.43	0.40	2.42	No Trend	0.7702
CRRMH	SCHLA	1.31	0.1558	0.03	7.33	0.94	12.85	No Trend	0.4972
CRRMH	STSS	6.44	0.7058	0.00	5.00	0.00	0.00	No Trend	0.7345
CRRMH	BTSS	3.93	0.6671	0.00	13.50	0.00	0.00	No Trend	0.5126
CRRMH	SECCHI	0.00	<0.0001	-0.02	1.95	-0.48	-24.46	Degrading	0.2454
CRRMH	SDO	0.00	0.0124	0.02	8.53	0.52	6.06	No Trend	0.9040
CRRMH	BDO	0.00	0.4979	-0.01	7.33	-0.20	-2.68	No Trend	0.6494
CRRMH	SSALINITY	0.00	<0.0001	-0.06	16.51	-1.96	-11.86	Decreasing	1.0000
CRRMH	BSALINITY	0.00	0.0001	-0.06	16.84	-1.81	-10.74	Decreasing	0.9997
CRRMH	SWTEMP	0.00	0.0061	0.03	18.50	0.87	4.72	Increasing	0.6880
CRRMH	BWTEMP	0.00	0.0940	0.02	17.83	0.56	3.13	No Trend	0.6457
PIAMH	SCHLA	2.07	0.2571	-0.02	7.69	-0.76	-9.89	No Trend	0.7932
PIAMH	SECCHI	0.00	<0.0001	-0.01	1.80	-0.44	-24.36	Degrading	0.6115
PIAMH	SDO	0.00	<0.0001	0.03	9.20	1.03	11.15	Improving	0.9113
PIAMH	BDO	0.00	<0.0001	0.04	8.28	1.24	14.98	Improving	0.1845
PIAMH	SSALINITY	0.00	0.0320	-0.03	18.17	-0.97	-5.35	No Trend	1.0000

Appendix A - Section II (continued). Seasonal Kendall long-term trends in water quality for all tributaries and the Virginia Mainstem Chesapeake Bay (1985-2015). Parameters are as follows: STN=Surface total nitrogen, BTN=Bottom total nitrogen, SDIN=Surface dissolved inorganic nitrogen, BDIN=Bottom dissolved inorganic nitrogen, STP=Surface total phosphorus, BTP=Bottom total phosphorus, SPO4F=Surface dissolved inorganic phosphorus, BPO4F=Bottom dissolved inorganic phosphorus, SCHLA=Surface chlorophyll *a*, STSS=Surface total suspended solids, BTSS=Bottom total suspended solids, SECCHI=Secchi depth, SDO=Surface dissolved oxygen, BDO=Bottom dissolved oxygen, SSALINITY=Surface salinity, BSALINITY=Bottom salinity, SWTEMP= Surface water temperature, BWTEMP=Bottom water temperature.

Segment	Parameter	% BDLs	P value	Slope	Absolute			Direction	Homogeneity	
					Baseline	Change	% Change		Trend test	P value
PIAMH	BSALINITY	0.00	0.0096	-0.04	18.92	-1.09	-5.74	Decreasing		0.9995
PIAMH	SWTEMP	0.00	0.0372	0.02	17.65	0.71	4.04	No Trend		0.4179
PIAMH	BWTEMP	0.00	0.1737	0.01	16.88	0.44	2.62	No Trend		0.5088
POCMH	SCHLA	0.89	0.1771	-0.03	10.40	-0.96	-9.25	No Trend		0.9308
POCMH	SECCHI	0.00	<0.0001	-0.01	1.10	-0.17	-15.66	Degrading		0.2581
POCMH	SDO	0.00	<0.0001	0.02	9.00	0.63	7.02	Improving		0.9328
POCMH	BDO	0.00	<0.0001	0.02	7.95	0.66	8.36	Improving		0.8744
POCMH	SSALINITY	0.00	0.0074	-0.04	19.02	-1.13	-5.92	Decreasing		0.9370
POCMH	BSALINITY	0.00	0.0046	-0.04	18.98	-1.15	-6.03	Decreasing		0.9385
POCMH	SWTEMP	0.00	0.1510	0.02	19.25	0.50	2.60	No Trend		0.7740
POCMH	BWTEMP	0.00	0.3423	0.01	19.00	0.30	1.56	No Trend		0.7495
CB5MH	SCHLA	0.34	0.0924	-0.03	7.04	-0.98	-13.94	No Trend		0.5689
CB5MH	SECCHI	0.00	0.0002	-0.01	2.15	-0.30	-13.86	Degrading		0.5702
CB5MH	SDO	0.00	0.0184	0.01	9.20	0.42	4.55	No Trend		0.0146
CB5MH	BDO	0.00	0.0603	0.01	6.99	0.41	5.82	No Trend		0.0785
CB5MH	SSALINITY	0.00	0.0135	-0.04	17.21	-1.13	-6.57	No Trend		0.9823
CB5MH	BSALINITY	0.00	0.7283	0.00	20.97	-0.14	-0.67	No Trend		0.7744
CB5MH	SWTEMP	0.00	0.9567	0.00	17.03	0.00	0.00	No Trend		0.5639
CB5MH	BWTEMP	0.00	0.5613	0.01	16.30	0.19	1.15	No Trend		0.4186
CB6PH	SCHLA	0.24	0.7337	0.01	6.84	0.20	2.94	No Trend		0.3594
CB6PH	SECCHI	0.00	<0.0001	-0.02	2.00	-0.49	-24.47	Degrading		0.2868
CB6PH	SDO	0.00	0.0135	0.01	8.49	0.35	4.08	No Trend		0.2983
CB6PH	BDO	0.00	0.0007	0.02	7.08	0.50	7.06	Improving		0.1084
CB6PH	SSALINITY	0.00	0.0529	-0.03	19.77	-0.78	-3.94	No Trend		0.9966
CB6PH	BSALINITY	0.00	0.0085	-0.03	23.41	-0.87	-3.71	Decreasing		0.7189
CB6PH	SWTEMP	0.00	0.3219	0.01	17.20	0.24	1.40	No Trend		0.2537
CB6PH	BWTEMP	0.00	0.4712	0.01	16.50	0.24	1.45	No Trend		0.4089
CB7PH	SCHLA	0.35	0.3521	0.01	5.10	0.41	8.04	No Trend		0.0274
CB7PH	SECCHI	0.00	<0.0001	-0.02	2.10	-0.52	-24.60	Degrading		0.1724
CB7PH	SDO	0.00	0.0025	0.01	8.30	0.42	5.03	Improving		0.8892
CB7PH	BDO	0.00	0.0010	0.01	7.70	0.44	5.75	Improving		0.3474
CB7PH	SSALINITY	0.00	0.1427	-0.02	20.82	-0.61	-2.94	No Trend		0.9637
CB7PH	BSALINITY	0.00	0.6134	-0.01	24.35	-0.18	-0.74	No Trend		0.4637
CB7PH	SWTEMP	0.00	0.0861	0.01	16.33	0.44	2.71	No Trend		0.5977
CB7PH	BWTEMP	0.00	0.3894	0.01	16.00	0.26	1.61	No Trend		0.5890
CB8PH	SCHLA	0.58	0.1491	0.02	4.48	0.70	15.68	No Trend		0.0006
CB8PH	STSS	0.03	0.6195	-0.01	6.53	-0.25	-3.80	No Trend		0.2683
CB8PH	BTSS	0.01	<0.0001	-0.14	11.73	-4.37	-37.26	Improving		0.8398
CB8PH	SECCHI	0.00	<0.0001	-0.02	2.03	-0.55	-27.02	Degrading		0.1407
CB8PH	SDO	0.00	0.4010	0.00	8.35	0.10	1.21	No Trend		0.8281
CB8PH	BDO	0.00	<0.0001	0.02	7.80	0.54	6.90	Improving		0.0833
CB8PH	SSALINITY	0.00	0.0010	-0.04	25.50	-1.40	-5.47	Decreasing		0.9969
CB8PH	BSALINITY	0.00	0.0330	-0.02	30.00	-0.65	-2.17	No Trend		0.3541
CB8PH	SWTEMP	0.00	0.1297	0.01	15.75	0.44	2.81	No Trend		0.6906
CB8PH	BWTEMP	0.00	0.6279	0.01	15.15	0.18	1.20	No Trend		0.4946

